DOCUMATIC

PARTICIPATORY, ANDROID-BASED MOBILE SHOOTING ASSISTANT, PRE-EDITOR, AND GROUNDWORK FOR SEMI-AUTOMATIC FILMMAKING

Andrew Quitmeyer

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1. PROJECT INFORMATION

The described work is completed in part as a Master's Thesis Project for the Digital Media program at the Georgia Institute of Technology.

COMMITTEE

Professors Michael Nitsche (chair), Carl DiSalvo, and Vinicius Navarro

THESIS

While digital filmmaking has broadened the accessibility of documentary film creation, legacy production practices persist of first gathering information (shooting) and later structuring the audio-video narrative (editing). *Documatic* aims to combine shooting and editing processes via synchronized smartphone camera/annotation-systems that automatically generate video "rough-cuts" for Adobe Premiere and Final Cut Pro.

CONTRIBUTION TO THE FIELD

Documatic's primary purpose is to uphold the spontaneity of the production process during the editing process, resulting in an overall more enjoyable experience for producers. This can lead to more abundant and ambitious projects being created due to the diminishing overhead of editing work. Also, the distribution of the capture and catalog of high density data between two individuals and a machine (the recorder, annotator, and digital editing assistant), frees the producers to pay more attention to the moment. Many important opportunities have been missed due to the overburdening of single documentarians attempting to grab stable, appealing audio and video, while simultaneously engaging the interviewee and compiling a mental catalog and structure of captured events. A distributed model reduces the overall stress in the moment, resulting in higher quality shooting and interviewing.

Moreover, much power is gleaned from the ability to build a narrative with semantically meaningful units that exist independent of strict linear frameworks. As compared to arbitrary, ad-hoc codings shared between editors, or structures formed mentally within a single editor, an overt diegetically significant coding can lead to more flexible and powerful editing.

For instance, this system would a) relieve stress from editors struggling to keep track of arbitrarily named footage, b) promote collaboration between multiple editors, c) simplify the re-arrangement of topics or

sections in the final documentary, and d) softens the learning curve for individuals learning to communicate through audio and motion pictures.

By providing a studied, digital re-interpretation of analogue film, Documatic seeks to lift some of the impediments to video editing and transform the process of documentary creation. As Manovich remarks, in film "most of its 'users' are able to 'understand' cinematic language but not 'speak' it (i.e., make films)" (Manovich, Language of New Media, 2000, p. 43). Perhaps by boosting the accessibility of film making, one can also achieve greater levels of media literacy.

KEYWORDS

editing assistant, pre-editor, android, smart phone, collaborative, filmmaking, documentary,

categorical documentary, procedural model, video elements,

NOTES:

The term "user" is employed throughout this paper with the meaning of "interactor".

SCHEDULE

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*Oct. 4	Thesis Proposal
Oct. 15	Completed Request for Approval
October	Documentary background research
October	Android Labs: Phone Sync+Camera Access
November	Design Interface/Workflow
November	Android Labs: Structural Design
* November 17	User Interaction wireframed
* November 30	Code structure fully outlined
December	Design Interface/Workflow
*December 5	Final Cut/Premiere XML foundation
* December 15	Real-time phone inter-communication
* December 20	CNN: Behind-the-Scenes tour
January	Android Coding
*January 16	Generates correct XML
* February 28	Functional code
March 1- 5	Interface design iterations
*March 5	Qualitative Testing
*March 11	Design Document Draft/Preview
April	Finalize Design Documentation
April 1-6	Qualitative testing II
*April 11	Defense
April 29	Signed Project Approval Forms

(* milestones)

11. ABSTRACT

Digital filmmaking has significantly impacted documentary films by decreasing the costs of production, editing, and distribution. Few digital affordances, however, have been applied to improve the actual filmmaking process. Currently, most documentary productions continue to abide by the legacy practices. First, documentarians gather massive amounts of subject information from archival footage, recorded interviews, and text. Next, the documentarians are forced to re-sort through the collected data and derive a structure for the eventual audio-video narrative. While this structural synthesis period distinguishes documentary from other film formats, as a stand-alone process it can be quite arduous.

Some video logging systems attempt to ameliorate the problem of sorting through droves of audio and video. These systems, however, are typically only used in large commercial or theatrical filmmaking as they rely on pre-established concrete master structures (such as shot lists).

Database film projects automate the structuring of video into dynamically ordered segments or presenting spatialized, interactive clips. To form any sort of distinct narrative with these systems still requires the intense sorting and editing process of traditional filmmaking.

Documatic aims to simplify the arduous structural synthesis process by combining it with more the exploratory, spontaneous "information gathering" segment. Via synchronized Android applications on a pair of smartphones, annotations can be added in real-time to recorded footage. The tagged footage generates an emergent structure which can be re-configured on the phone itself, and added to in tandem with the collection of information. Finally, as the amassed data is downloaded to a computer, *Documatic* utilizes the structure and tags with its XML generator to create "pre-edited" rough-cut, video sequences for Adobe Premiere and Final Cut Pro. In this way, the adventuresome spirit can carry through the entire production experience.

Documatic's structural basis is based on theories and research of analogue documentaries in order to preserve the cinematic grammars culturally developed over the past century. The end product will be more or less indistinguishable from a traditional, linear documentary film, but the new formative process will hopefully be simpler, more efficient, educational, and fun.

III. INTRODUCTION

PROBLEM: *Analog practices in a digital medium*

The advent of digital video recording devices has opened the doors to many small-scale filmmakers by greatly reducing the costs associated with capturing and manipulating moving images. Unfortunately however, the arduous production practices developed in analog filmmaking needed to organize and edit a finalized film remain largely untouched. Thus, even though both small independent films and large studio productions can be now shot, pieced-together, and shared completely digitally, the studio is still able to create cinematic content more efficiently due to its ability to sort through and organize much more massive scales of collected content. Whereas a small documentary team may make take years to plan, shoot, and edit a 120 minute film, the sheer manpower of a large studio can produce a similar amount of content in a matter of weeks.

Massive Information Organization

Part of this problem is derived from the fact that many smaller scale video productions (documentary films in particular) tend to share a common pattern, "shoot, then structure". As one of the creators of the "Evolving Documentary", Michael Murtaugh notes,

> The "traditional" process of making a documentary film could be roughly described in the following way: the filmmakers collect a large amount of raw material -- original film footage, archive photographs, text articles. These raw materials are organized in progressively larger chunks: shots, scenes, and sequences. Finally, sequences are edited together to form the final "cut" of the film... in this way the filmmaking process may be seen as a kind of funnel [where] a large collection of content... is gradually refined and reduced (Murtaugh, 1996).

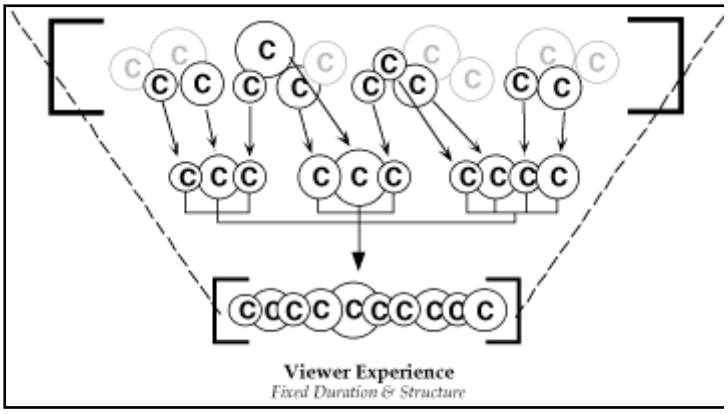


FIGURE 1 - "TRADITIONAL VIDEO PRODUCTION MODEL" MURTAUGH, *CONTOUR*

This "shoot then structure" model puts a massive burden on the filmmakers, forcing them to examine and arrange hours of collected content in order to distill a coherent work.

An extreme example of the documentarian as editor comes from Werner Herzog's film, *Grizzly Man*. In this film, Herzog shot very little of the footage ever shown on the screen. Alternatively, he was tasked with poring over hundreds of hours of the subject's raw footage and then converting it into a cohesive narrative. Many Michael Moore films, such as *Fahrenheit 911*, also rely heavily on existing material, but from multiple sources. This "compilation"-style documentary, as identified by Bas Raijmakers in the paper "Design Documentaries", leads to an even more intensive editing experience as the documentarian is then charged with balancing "the intended meaning of the footage and the perspective added by reconstituting the material" (Raijmakers, 2006).

Bernard Weiner describes the goal of this obligatory process as "revisiting existing footage to construct out of it an alternative and maybe even directly oppositional narrative from that which it inherently possesses" (Weiner, 1971). Whether this existing footage came from internal or external sources, the temporality of video and audio data means that editors in either case will receive a collection of largely uncategorized information. The editor, then, is always charged with the dual, recursive task of fitting items into the configuration of a linear film, while simultaneously crafting the film's exact structure.

This unfortunate chore for the filmmaker as a "video funnel" derives from the legacy production practices developed by analog filmmakers decades ago. The typical production process for cinema can be thought of as, Pre-Production, the planning and writing stage, Production, the filming stage, and Post-Production, the stage where all of the collected footage is edited together to form the final viewing experience. The beginning of film history featured many smaller productions with independent auteurs carrying out each of the tasks of the production phases independently. For example, a series of photographs is shown below depicting Charlie Chaplin performing all of the tasks of writing, filming, and editing a motion picture.

PRE-PRODUCTION → PRODUCTION → POST-PRODUCTION

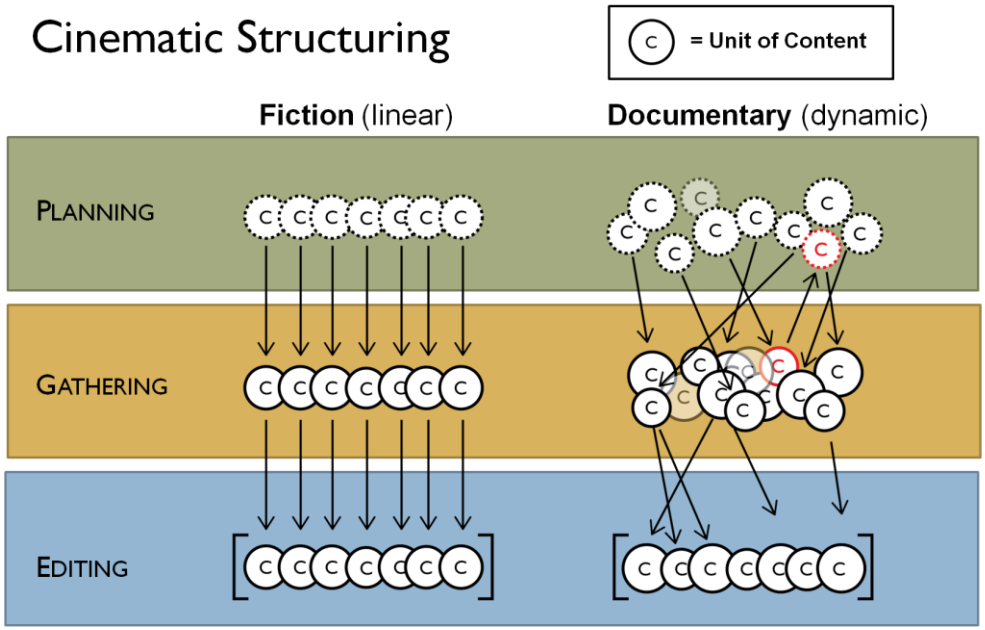
WRITING → FILMING → EDITING

In an effort to streamline the production process, studios began to apply lessons from the industrial revolution to this new medium. lessons from the industrial revolution began to be applied to this new medium in an effort. In *The Language of New Media*, Lev Manovich notes, "Ford's assembly line relied on the separation of the production process into a set of repetitive sequential and simple activities...Cinema followed this logic of industrial production as well" (Manovich, Language of New Media, 2000). By transforming the entire filmmaking process into a linear series of discrete tasks, and then distributing these tasks amongst many individuals and groups, large film studios were able to achieve more efficient, rapid filmmaking. Unfortunately, this industrial model does not work for smaller productions, like most documentary films, as they lack the manpower to achieve the efficiency of a large distributed workforce. Consequently, smaller film productions would be at a loss to compete with big studios.

Dynamic Structuring

Another hindrance arises in that documentaries in particular tend to be produced in a more dynamic fashion that large theatrical studio films. A fiction film can be planned out in its entirety and then rigidly follow this static blueprint for the rest of production making the editing process nearly trivial. Documentaries, on the other hand, must allow for unforeseen events and interviews with outcomes far different than could have been planned.

The top of Murtaugh's funnel diagram can be thought of as an information gathering stage, where interviews are recorded, illustrative video is shot, and supporting audio and visual materials are collected. This process of documentary production is characteristically more spontaneous and exploratory than in a theatrical film. Chris Smith's film, *American Movie*, for instance, initially seeks to chronicle a the making of *Northwestern*, the feature film which fanatical blue-collar filmmaker, Mark Borchardt, had been planning for years. Originally, American Movie had aimed to document Mark Borchardt's production practices from script to screen, but by *Northwestern*'s fourth pre-production meeting, Borchardt has to shut down production due to many financial, inter-personal, drug-related, and production difficulties. Instead, Borchardt then attempts to complete the production of an altogether different film started many years earlier entitled, *Coven*. This meant that the documentary's core narrative, the making of *Northwestern*, was suddenly gone. To cope with the changing situation, the creators of *American Movie* continued documenting Borchardt's progress over the next several years, adapting and expanding their film's planned structure with every unforeseen event that occurs. American Movie's eventual includes not only the production process behind Mark Borchardt's "latest" film, *Coven,* but also the larger narrative lurking behind the biography of the obsessive filmmaker.

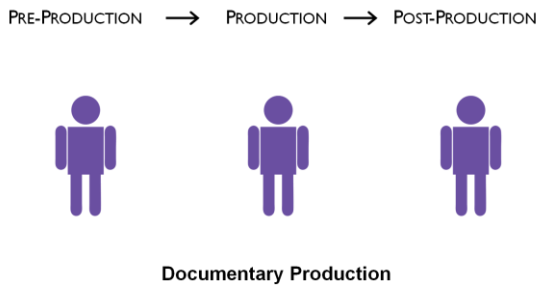


In documentary production, there always exists the possibility that unexpected events could significantly alter the planned direction of a film. Also, information collected during the filming phase of a

documentary, can give rise to new ideas for planning further shoots creating a sort of feedback loop between the pre-production and production cycles particular to documentaries. Thus, since many documentaries are focused on real-world events and people which act out of the control of the filmmakers, when compared with theatrical films, they face the additional difficultly that their structures could branch or mutate at any point in a expansive or divergent way.

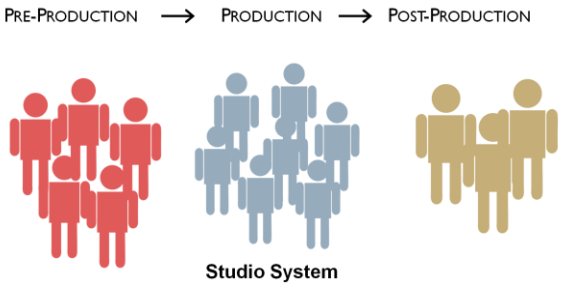
Large-Scale Competitors

The tasks of funneling massive amounts of unorganized footage and continuously vacillating between capturing footage and re-structuring the project make documentaries one of the most difficult media in which to work. The documentarian must not only organize the deluge of information, but also sculpt an engaging, concrete structure from its often changing pieces. The unique qualities that arise from its rigorous and dynamic production process, however, also help to define documentary from other types of film.



Documentary Production

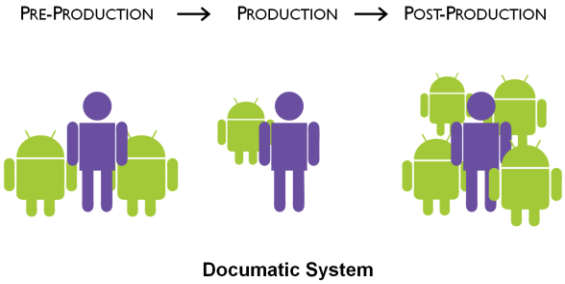
Traditionally, they way in which the large studios dealt with the organization and structuring problems of motion pictures, was to distribute the filmmaking process into simpler tasks among dozens or hundreds of individuals.



Studio System

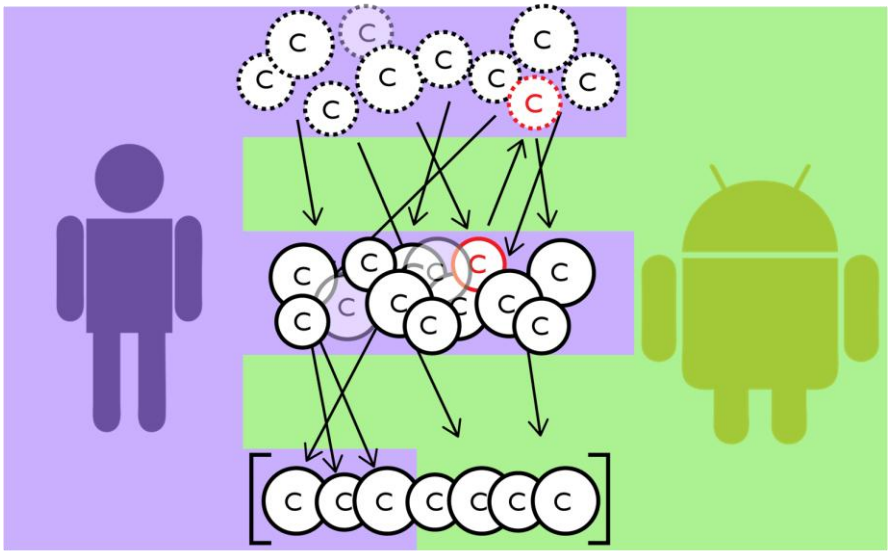
Unfortunately, small documentary groups lack the manpower to achieve these levels of efficiency. The digital automation and or parallelization of some of these simpler tasks of the studio's production process, could, however, replace some of these gaps in manpower. In this way, small documentary productions can begin to enjoy some of the filmmaking

efficiency afforded to the big filmmakers, while maintaining the artisanal quality control of a small team.



PROPOSED SOLUTION: *Semi-Automatic Filmmaking*

This project, *Documatic*, seeks to develop a system that combines the shooting/information-gathering process with editing/structural-synthesis to allow semi-automated production of *concrete* video stories following established documentary models. The end product will be more or less indistinguishable from a traditional, linear documentary film, but the new process leading to its creation will hopefully be simpler, more efficient, educational, and fun.



DESIGN GOALS

From the analysis of the above historical and structural difficulties in cinema and documentary filmmaking, I derive my generalized Design Goals for Documatic and Semi-Automatic Filmmaking:

Efficiency

It needs to efficiently keep track of data, and automate structuring, However, it shall make no permanent changes to data that would interfere with the later design goal of "Agency."

Independence
You should not have to rely external data networks like cell signals to capture the shots you need.

Agency
The filmmaker or documentarian should have full agency to direct the outcome of the project, and the digital component should be entirely non-destructive, that is, even if my system breaks, or performs oddly, the documentarian is still left with all the footage, as if they have shot a traditional documentary

Readability
The final outcome of the documentary project should be indistinguishable from a traditional documentary. This work should follow the conventional film grammar already embedded within our culture.

Adaptability
Finally it should react the dynamism of the documentary creation process. A balance needs to be created within the project concerning its ability to plan out certain situations, while also quickly reacting to new developments. As Sheila Bernard states in her book, *Documentary Storytelling,* "You can't know where real life will take you but you can certainly anticipate a range of outcomes and determine whether or not the story holds sufficient promise" (Bernard, Documentary Storytelling for Film and Videomakers, 2004).

TARGET PROBLEM SPACE

The realm of documentary film is quite vast, and any attempt to remediate or digitize aspects of the medium will invariably raise and give birth to many new problems, needs and to be addressed. Given the time constraints associated with this Master's Thesis project, some

items of concern will be tackled to a lesser degree than others. Thus it will be necessary to define the scope of this particular project outside of the realm of digital documentary remediation, or semi-automatic filmmaking in general. I aspire to identify what problems will serve as the primary concern, and which aspects will have to wait for future iterations of the project.

The primary concerns of this project are that of structural generation, inter-communication, and user experience. Structural generation includes both the methods and theories of how the raw content will be converted into a meaningful linear stream. The inter-communication aspect will be necessary for the division of labor during filming, and provide the foundation for combining the information gathering and editing aspects of production. User experience design will be used to refine and enhance the interactor's access to the two aforementioned aspects, and give form to the overall production process.

All three of these elements are necessary for a functional product. At first, I started my system's design primarily focusing on the structural generation and inter-communication aspects in order to build an initial prototype. After the examination of several use-cases of the early forms of this device, I was then able to address the user-experience component of the problem space to a larger degree. Thus, by the end of the project, all three aspects of this problem space have been addressed. Now the overall system could simply benefit from continued iterations and research into each area of the outlined problem space.

IV. CURRENT FIELD

VIDEO TAGGING/METADATA SYSTEMS

Video logging systems, such as Adobe's *OnLocation* software, permit filmmakers to add supplementary information to movie files such as shot number, scene, description, camera information, timestamp, and ownership. When this commenting system is rigorously adhered to, it truly can match the products claim of providing "greater efficiency in postproduction" (Adobe Systems Inc., 2010) by allowing groups of editors in large productions to more easily sort through vast amounts of footage.

Most of these logging systems are intended for large commercial or theatrical video productions, however, and they function as little more than a modern "clapboard". This linear style of metadata (shot, scene, and camera information) must be used with a previously established master structure since the tags themselves bear little semantic meaning. Thus, these current systems do little to aid documentary filmmakers whose movies' structures have not yet been formed.

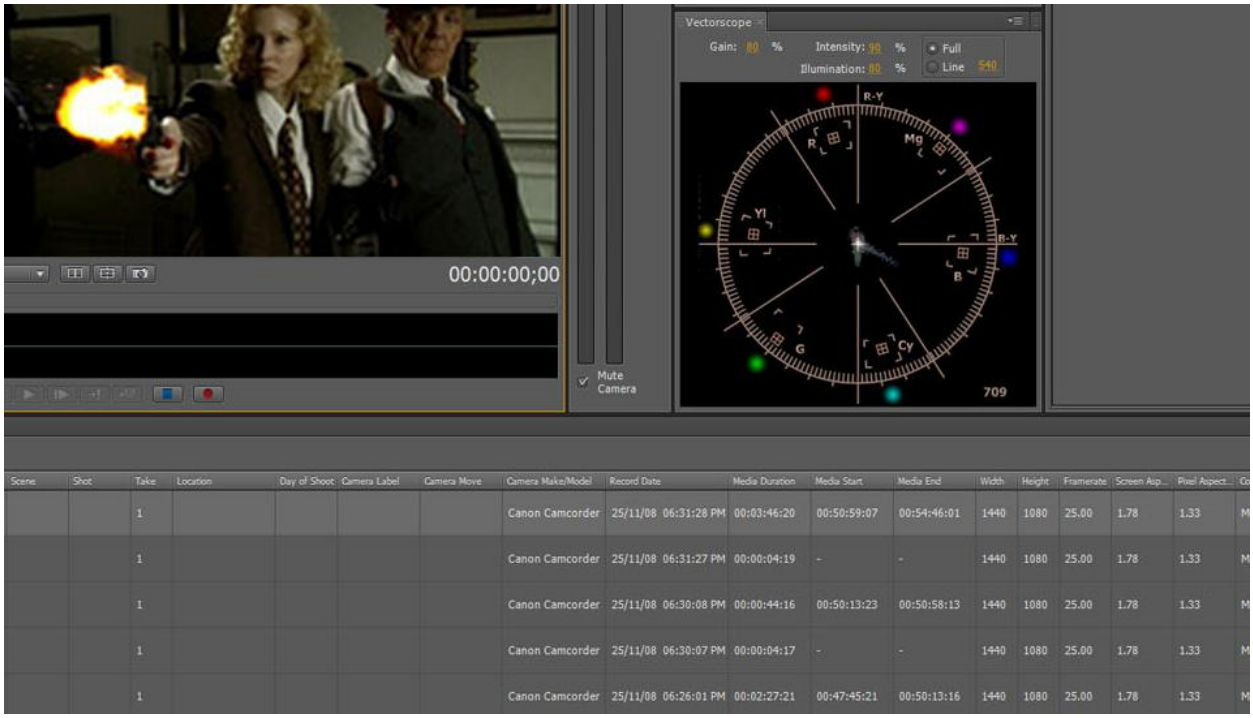


FIGURE 2- ONLOCATION LOGGING INTERFACE (TRUSTEDREVIEWS.COM)

DATABASE FILMMAKING

On the other side of production, many artists are attempting to solve the filmic problem of manual structuring entirely, by means of procedural sequences. Creator of the database film project, *Soft Cinema,* Lev Manovich states,

> Rather than beginning with a script and then creating media elements which visualize it, I investigate a different paradigm: starting with a large database and then generating narratives from it (Manovich, Form).

The project *Soft Cinema* consists of a growing database of audio and video data collected during Manovich's travels, broken into brief clips and assigned ten different semantic and formal parameters (Soft Cinema - Interview with Lev Manovich, 2003). Then, after manually requesting

specific features, (such as places, shot types or content) *Soft Cinema* generates a collection of video windows. Though, the gathered information must still be sorted through and thoroughly tagged for the generated work to posses any intrinsic meaning, the automatically produced filmic experience partially solves the basic editing problem of large video collections. The final work could also serve as a method of *documenting*, though the end result is quite different from a *documentary*. First, the presented piece tends to be quite non-narrative and non-teleological. Segments cast impressions and inter-relate, but as a whole, the pieces seems to just "exist". Secondly, the products use seems to be to explore more experimental and filmic concepts such as "videos with camera movement to the left" (Soft Cinema - Interview with Lev Manovich, 2003). Lastly, as Manovich himself mentions in his "Language of New Media,"

> "A hundred years after cinema's birth, cinematic ways of seeing the world, of structuring time, of narrating a story, of linking one experience to the next, are being extended to become the basic ways in which computer users access and interact with all cultural data" (Manovich, Language of New Media, 2000).

By using the spatial affordance of digital media (Murray, 2010) in his remediation, Manovich liberates the video form, but also somewhat corrupts the basic linear grammar of film developed since cinema's birth. Thus new knowledge is needed to "read" the experience of *Soft Cinema*,

FIGURE 3- MICHAEL MURTAUGH'S "CONTOUR"

as well as its traditional cinema counterparts.

Two other database film research projects, Michael Murtaugh's *Automatist Storytelling System* and the Georgia Tech's Experimental TV Lab (ETV) seek to utilize databases to empower documentary form. Murtaugh's piece, ConTour, tags, and generates sequences video clips in a manner similar to *Soft Cinema*. While visually spatialized, the clips are played linearly with algorithms designed to lead an interactor through the bulk of the data. One of Murtaugh's primary goals with the project was to investigate the idea of the "Evolving Documentary" where films could be kept up-to-date automatically as new information is gathered on a topic (Murtaugh, 1996).

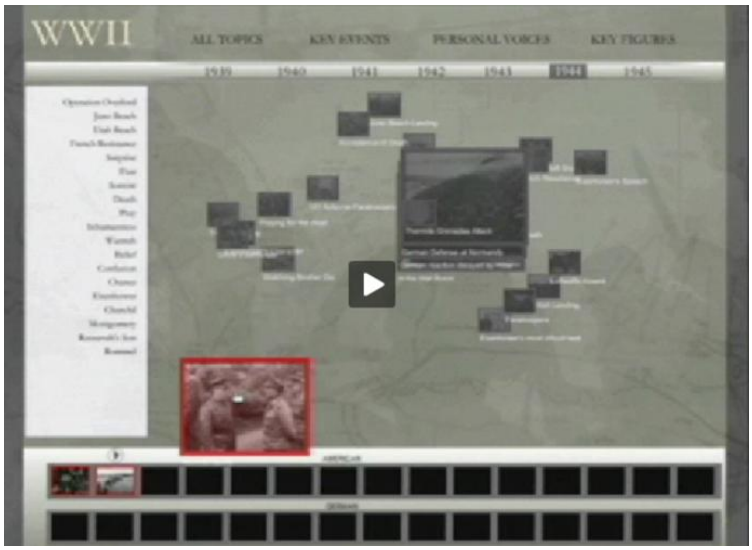
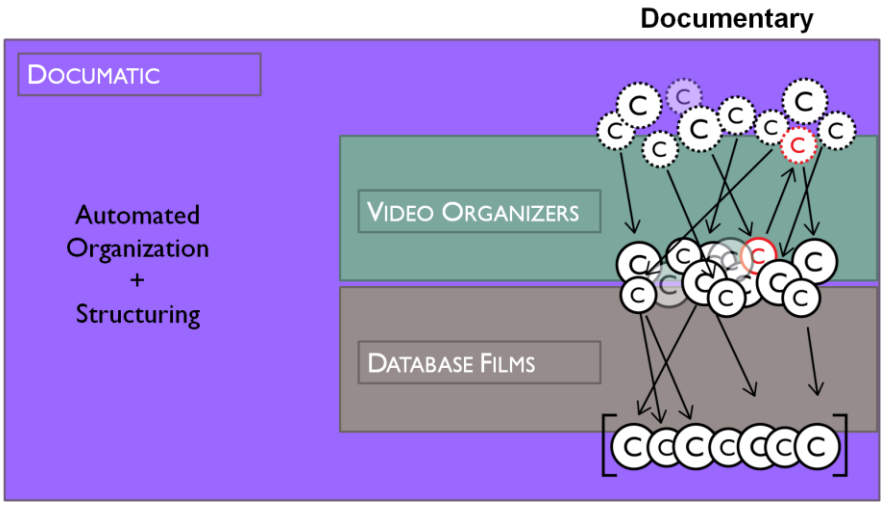


FIGURE 4- ETV'S "WWII EXPERIENCE: D-DAY" (GEORGIA TECH)

One of ETV's projects, "World War II Experience: D-Day", harnesses and refines many of ConTour's innovations in information sorting and automated storytelling, while adding a participatory affordance. Users are able to navigate through topics and view generated linearized video results. Furthermore, ETV pushes beyond the "Evolving Documentary" to allow any interactor to upload and tag their own footage.

The exploratory experience of the viewers digging through permits them to uncover and analyze a topic in their own manner and also facilitates production by shifting the structuring burden from editor to viewer. Some filmmakers, however, may not like the inability to directly form and optimize their conveyances, and some viewers may desire a more "lean-back" approach to their media consumption.

These concerns maintain Documatic's goal to create videos accessible in the same way as traditional documentary film. The process leading to this work, however, builds upon the innovations of this prior research in multimedia data-logging and content generating methods of the aforementioned products.

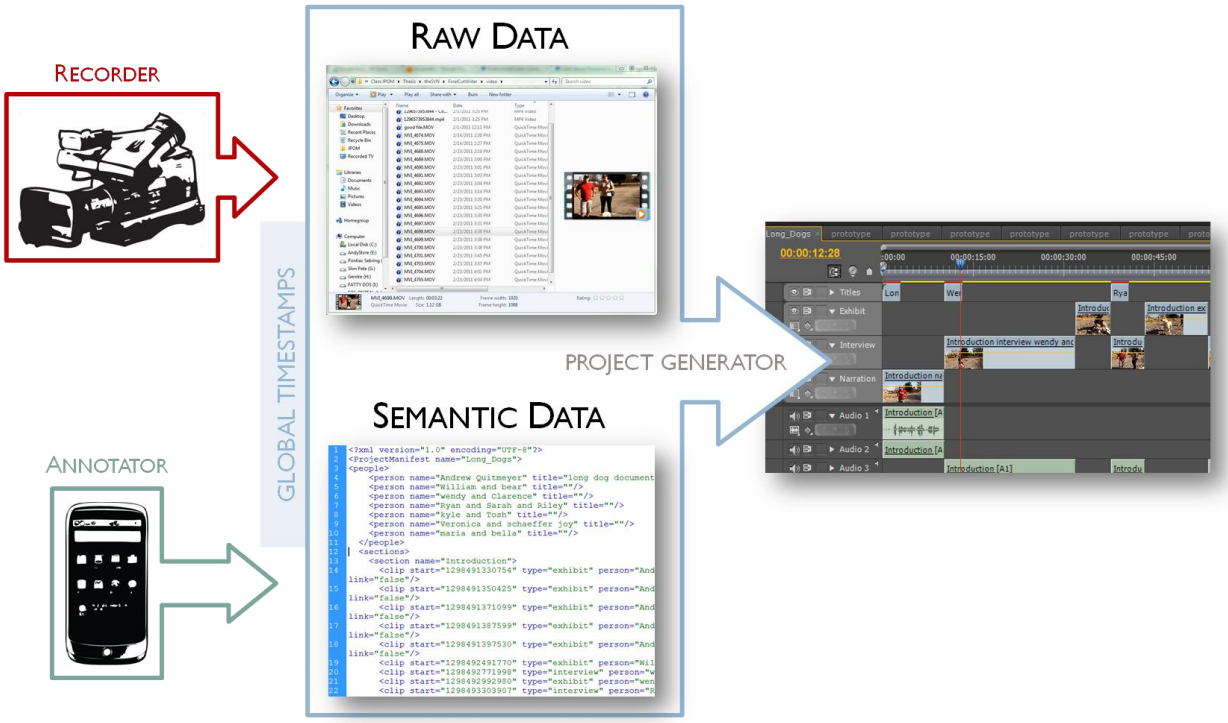


Overall, the field of video production automation consists primarily of either products organize and label footage that is being collected, or software to automatically structure pre-annotated footage into a viewable experience. Documatic's goal is to unite the capabilities of these existing artifacts in order to form the a fully digital production experience all the way through.

V. DESIGN

FUNCTIONALITY

The functionality of this product is derived from the pairing of a pool of raw, unorganized data (folders of unlabeled video content) with a collection of semantic data (xml annotations of specific time-periods) via global timestamps in order to automatically generate an editable sequence in an editor such as Adobe Premiere or Final Cut Pro. With my system, the raw data can be collected from any digital video recording device, and the annotation data is created by the Documatic app running on an Android device. By simply synchronizing the internal clocks of the desired camcorder(s) and the Android device with the current internet time (such as nist.time.gov), no further communication is necessary to allow the devices to work together.



This means that while the filmmakers are working, there is no underlying reliance on Bluetooth or cell phone data networks to maintain consistency across the project. Nor do the filmmakers need to worry about recording or annotating with a specific device All aspects of the project are standardized by following universal time. The Documatic app places timestamps on every piece of data collected, and the video clips all contain metadata describing when each file was

created. The Project Generator module then handles the math needed to pair a specific set of video frames with the appropriate set of annotations. Finally, after this pairing, the Project Generator uses the data from the annotations to automatically arrange the clips in the video editor according to an underlying procedural model (in this case it is based upon the categorical documentary described by Bordwell and Thompson). At this point the documentarians can simply refine the pre-edited footage in the traditional fashion.

FIGURE 1 - EXAMPLE OF RAW, NON-ANNOTATED VIDEO DATA SHOWING EMBEDDED META-DATA LIKE IMAGE DIMENSIONS AND MODIFICATION DATES

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <ProjectManifest name="Long_Dogs">
3    <sections>
4      <section name="Introduction">
5        <clip start="1298491330754" type="exhibit" person="Andrew Quitmeyer" title=
   "long dog documentarian" end="1298491336983" duration="6229" link="false"/>
```

FIGURE 5 - EXAMPLE OF THE ANNOTATION AS AN XML "VIRTUAL CLIP" SHOWN WITH TIMESTAMPS AND SEMANTIC DATA

PROCEDURAL MODEL: *The Categorical Documentary*

The first step in any automation process is the creation of rule sets. These rules are necessary to transform any continuous real-world process, into a discrete series of tiny steps that can be completely programmatically. However, developing a set of rules that could account for the variety of potential representations offered by the

visual, aural, and temporal nature of film can be a daunting task. Concerning the fluidity and manipulability of the videographic medium, documentary filmmaker Joris Ivens notes, "[While,] the basic content must be in the shot to begin with...at each stage the effect of the shot can be changed...from developing, printing, editing, commentary, sound effects, music" (Bordwell & Thompson, 2004). In film, changes made at any stage from planning to public projection instill different meaning to the final witnessed experience.

Therefore instead of attempting to design a massive program capable of handling these innumerable factors in a meaningful way, I intend to first remediate the fuzzy concept of a "documentary" into a very specific, standardized form. This means that not only will rule-sets exists to tell the program how to arrange footage, but the filmmakers will also be scripted into a particular style of filmmaking. To stay true to the roots of the prior medium, Documatic's model for producing films will build from the cinematic grammars and practices developed in the 20th century and embedded in our culture.

To design a procedural model for filmmaking, I turned to established film theorists. In their book, *Film Art*, Bordwell and Thompson identify two primary types of documentary film, **rhetorical form** and **categorical form** (D. Bordwell, 2004, p. 132). Pure rhetorical form specifically strives to "persuade the audience to adopt an opinion" (Bordwell & Thompson, 2004, p. 140). The topic can be provable by scientific fact, such as a film detailing the process of mitosis, but empiricism is not necessary, such as why one should vote for a certain candidate. The and relies on emotional appeals, subject and viewer centered arguments, and arguments from seemingly reliable sources (Bordwell & Thompson, 2004, p. 142). Because the primary focus of the this type of documentary is simply to prove or illustrate a specific manner of thinking, the cinematic structure of a rhetorical film is subservient to its argumentative form. Since an argument can be structured in many different ways, the cinematic structure tends to be singular to a specific film. For example, the manner in which diagrams, interviews, narration, and other illustrative footage are arranged for a scientific film, may have no relation to the way in which these elements are arranged for a different political film.

Categorical documentary films, on the other hand, make less explicit arguments, and instead focus on simply conveying diverse information in an organized way about a particular subject matter. This format follows very simple, consistent pattern regardless topic. First, the subject is

introduced, and then the viewer is presented with a series of interviews or narrations grouped into topics associated with the overall subject. Bordwell and Thompson's archetypical categorical documentary film, *Gap-Toothed Women,* presents this basic structure:

> Title/Theme - *Gap-Toothed Women*
> 1. Introduction of a few gap toothed women
> 2. Genetic and Cultural Explanations for gaps
> 3. American Stigma
> 4. Careers and Creativity
> 5. Epilogue
> 6. Credits
>
> (Bordwell & Thompson, 2004)

FIGURE 6: VIEWER EXPERIENCE OF CATEGORICAL FILM

Thus Bordwell and Thompson's "categorical" film can be described by the following rule::

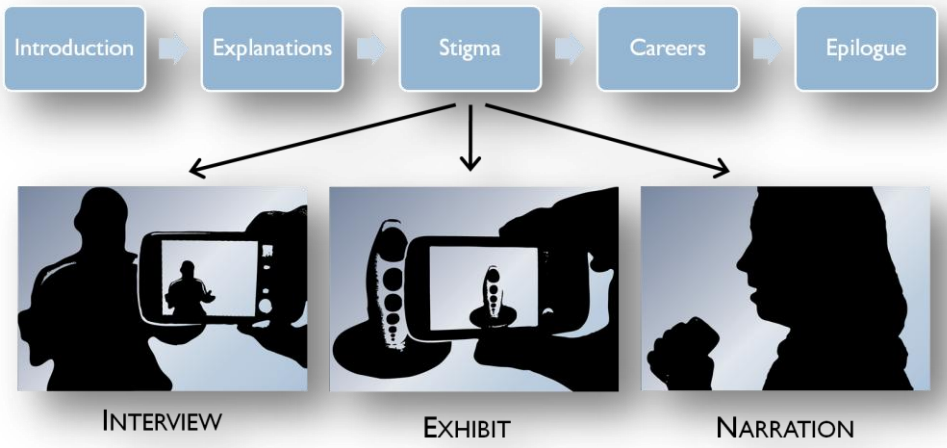
> 1) A CATEGORICAL DOCUMENTARY CONSISTS OF A SERIES OF TOPICS ABOUT A PARTICULAR SUBJECT

The order in which these sections are arranged, creates the overall narrative experienced by the viewer. Additionally, the temporal arrangement of these sections can be based upon external factors, such as the order that certain events happened in real life. Therefore, even films such as Morgan Spurlock's *Super Size Me*, can fit the categorical film model as it consists of a series of sections detailing portions of the fast food industry, while the arrangement of these sections describes the overall narrative concerning the transformation of the filmmaker's body.

Though Bordwell and Thompson warn that "because categorical form tends to develop in fairly simple ways it risks boring the spectator," they also remark on a strength of the form in that, "the categorical form can maintain interest by mixing in other kinds of form...[even] rhetorical form" (D. Bordwell, 2004, p. 134). Thus it is this simple, yet potentially powerful cinematic configuration upon which *Documatic* will be based.

DEEPER RULES: INTERVIEW, EXHIBIT, NARRATION

Using this categorical model to simply arrange footage into groups based is a good start for organizing the footage. One could imagine the use if, after filming several interviews, every time the interviewees spoke about "American Stigma" these sequences were automatically gathered together in one bin, and all the sequences mentioning "Careers and Creativity" were relegated to another. Automating this process alone, would already lift the burden of keeping track of many specific instances of time scattered across hours of footage.



To supply an additional reprieve for the filmmaker, I also constructed a supplementary rule-set would to aid in actually editing the footage once it has been organized. This secondary rule-set breaks down an individual section of the categorical documentary into three fundamental footage elements: Interview, Exhibit, and Narration.

Interview footage

Interview footage serves as the bulk of the content for most categorical documentary films. It simply consists of video from a camera pointed at a person (typically a close-up head shot), who is describing or answering questions about something. A single recorded interview with a person is chopped apart into smaller interview clips, and these clips from different interviewees are grouped according to what was being said in each clip. These groupings by topic form the individual sections of the overall categorical documentary.

Exhibit footage

In order to make a documentary more engaging, it can be helpful to show the audience what the person being interviewed is talking about In *Documentary Storytelling*, Sheila Bernard describes a must for documentary production,

> "Is the story visual, and if not, can you make it visual? This is an important question whether you're telling a modern-day story that involves a lot of technology or bureaucracy, or you're drawn to a historical story that predates the invention of still or motion picture photography. A film subject that doesn't have obvious visuals requires additional foresight on the part of the filmmaker; you'll need to anticipate exactly how you plan to tell the story on film" (Bernard, Documentary Storytelling for Film and Videomakers, 2004).

This is a common feature of nearly any video interview. For instance, while an interviewee in *Gap-Toothed Women* delivers an anecdote about the characteristic "Gap-toothed" bit pattern that she would leave in food, a video image of that exact bite pattern is shown directly to the viewer. While the video from the interview is momentarily replaced with that of the apple close-up, the audio from the interviewee is not interrupted at all. This delivers the effect of simply visually illustrating what is being said. For Documatic, this type of footage can be optionally linked to a specific person, or piece of narration in addition to the topic with which all footage elements are associated.

Narration footage

Whether or not this final video element, narration, is incorporated into the project at all is up to the discretion of the director. Errol Morris's films, like *The Fog of War*, have little or no narration, and consist entirely of interviews and exhibit footage. Other films, like *Hearts of Darkness: A Filmmaker's Apocalypse*, utilize narration to smooth the links between sections of the documentary and establish a more solid narrative throughout.

In the context of Documatic, narration clips are left as optional elements which simply provide an Audio-only introduction to a particular section. Exhibit footage can be linked to a specific piece of narration, and automatically grouped with it during the editing process.

Thus, adding this deeper set of rules, to Bordwell's concept of a "categorical" film, results in this full rule-set that governs the output and production of a Documatic documentary:

> 1) A DOCUMATIC DOCUMENTARY CONSISTS OF A SERIES OF TOPICS (**SECTIONS**) ABOUT A PARTICULAR SUBJECT.
>
> 2) EACH **SECTION** CAN CONTAIN PIECES OF **INTERVIEW, EXHIBIT,** OR **NARRATION** PERTAINING TO ITS TOPIC .
>
> 3) AN **INTERVIEW** CLIP CAN BE OVERLAID WITH AN **EXHIBIT** SEGMENT OF FOOTAGE WHICH ILLUSTRATES WHAT IS BEING DESCRIBED IN THE **INTERVIEW**.
>
> 4) AN **INTERVIEW** CLIP CAN BE OVERLAID WITH **TEXT** OF FOOTAGE WHICH CONVEYS INFORMATION SUCH AS THE INTERVIEWEE'S NAME.
>
> 5) A **NARRATION** CLIP CAN INTRODUCE A **SECTION** AND BE OVERLAID WITH AN **EXHIBITORY** SEGMENT OF FOOTAGE WHICH ILLUSTRATES WHAT IS BEING DESCRIBED IN THE **NARRATION**.

By using these simple rules to guide the production process, and then applying them to the Project Generator construction of a video sequence, many steps of the filmmaking process can be automated, and a great deal of effort can saved by the filmmaker in terms of organization and structuring. Using a logical system has the additional benefit in that individual projects can be handed off to a third-party without additional guess-work or extra explanations.

SYSTEM OVERVIEW AND WALKTHROUGH

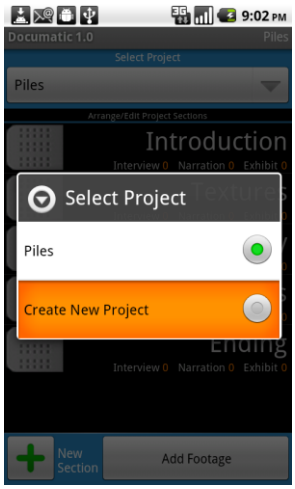
For a sample, step-by-step walkthrough, we will describe the an actual[1] use case of the Documatic system. Mariam, one of the first users of Documatic, is interested in creating a documentary about people and their dogs in the park. Mariam asks her friend Andy for help filming the

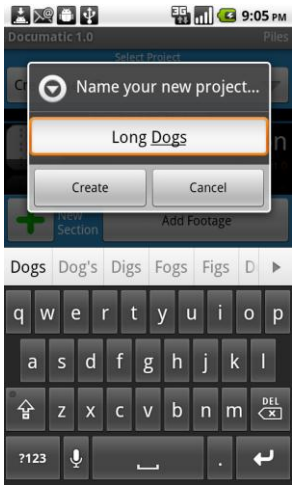
[1] For didactic purposes, some of the precise details of the actual filmmaking may be slightly altered (sometimes Mariam did things that Andy purportedly did, or vice-versa), but the basic process represented is true to the production.

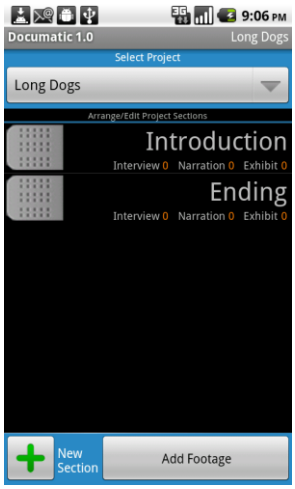
documentary, but she wants control of the project as its main director.

PRE-PRODUCTION

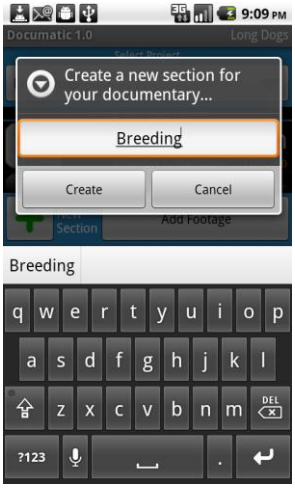
As a very first step, Mariam launches the Documatic App from her Android-powered smartphone (a Nexus One). She selects the project slider and creates a new project called, "Long Dogs." A new project is automatically generated for her with initial "Introduction" and "Ending" sections.

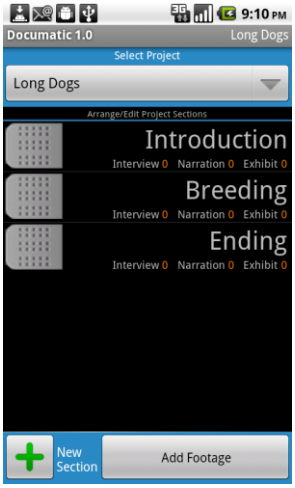






Before they even begin shooting video, they chat with each other about possible topics or interview questions they would like to ask. For each questions they come up with, they add it as another section to the overall project via the "New Section" Button. Eventually, they compile an initial ordered list of tags which represent both the questions they want to ask, and the sections that will comprise the final film.

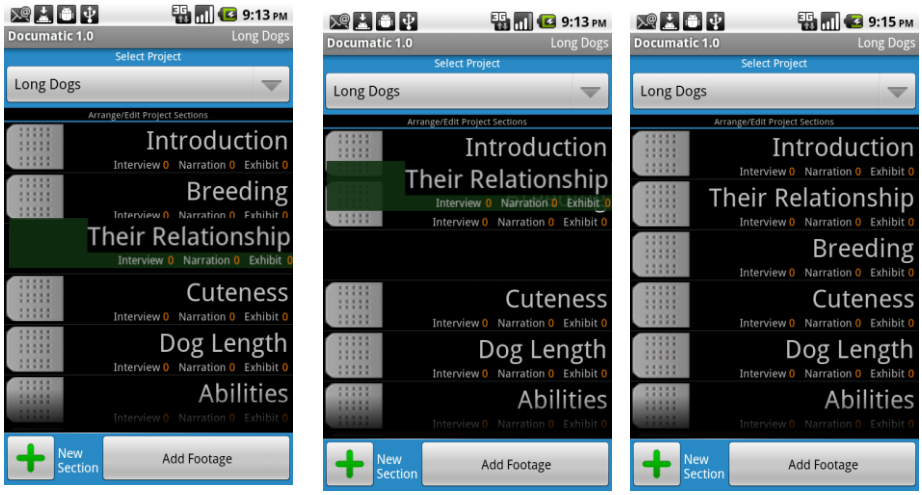




At this point, their Dog Documentary is structured like this:

Introduction -- Breeding -- Their Relationship -- Cuteness -- Dog Length -- Abilities -- Ending

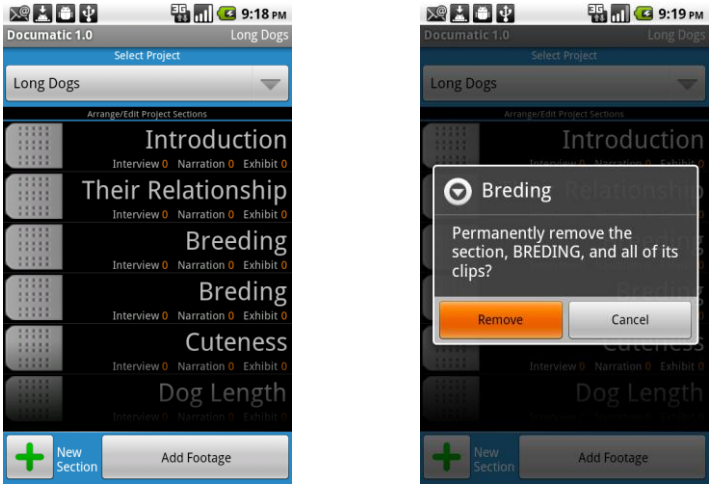
During this preliminary planning phase, Mariam, however, decided that, in the final sequence, the section entitled "Their Relationship" should come right after the introduction, and before the section about dog breeding. To re-arrange the order of these sections, she simply grabs the section by its textured "handle," and drags it to the desired location.



The sections can be re-arranged at any point during the creation of the documentary. Now the structure of her documentary is formulated like this:

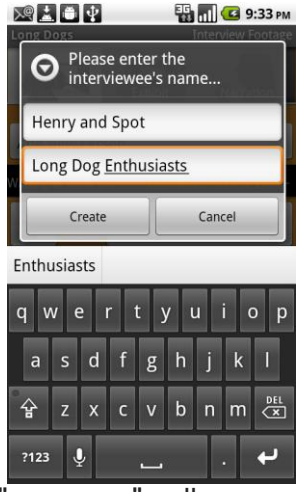
Introduction -- Their Relationship -- Breeding -- Cuteness -- Dog Length -- Abilities -- Ending

Also while Mariam was inputting the sections, however, she accidently added a superfluous section with the misspelled name, "Breding." Then, to remove the offending section, she simply clicks its name in the list and holds down until an alert menu asks her if she wishes to delete it.



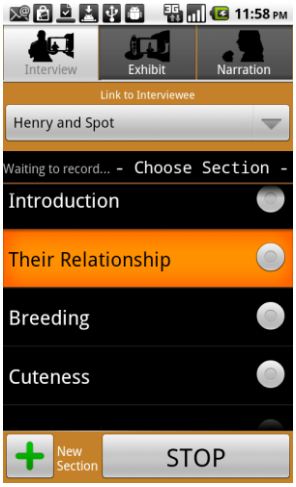
PRODUCTION: RECORDER AND ANNOTATOR

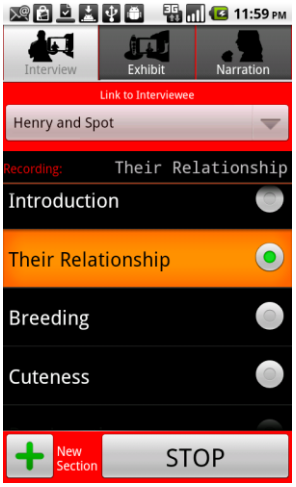
When Mariam and her cameraman, Andy, arrive at the park, the first thing they need to check, is that the Mariam's phone (which she is using to annotate the footage shot by Andy) is set to the same time as Andy's camcorder. Andy looks at Mariam's phone, and goes into his camera's menu and quickly sets it to the correct time. Now the pair is ready to conduct interviews!

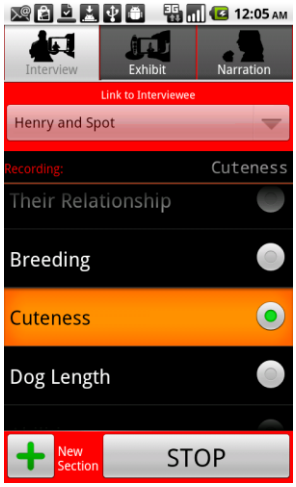


When a person shows up, Mariam, acting as the "annotator," collects the subjects preliminary information, like their name and title or occupation. While this is happening, Andy, acting as the "recorder" frames up the subject and starts the camera recording. Then Mariam begins the interview by asking questions whenever she and the subject are ready.

At this point, Andy's job as the recorder is very simple and relaxed. All he has to worry about is keeping the person roughly in the frame (and maybe monitoring audio levels). He does not have to worry about the interviewee's responses, and is thus able to get the highest quality footage possible.



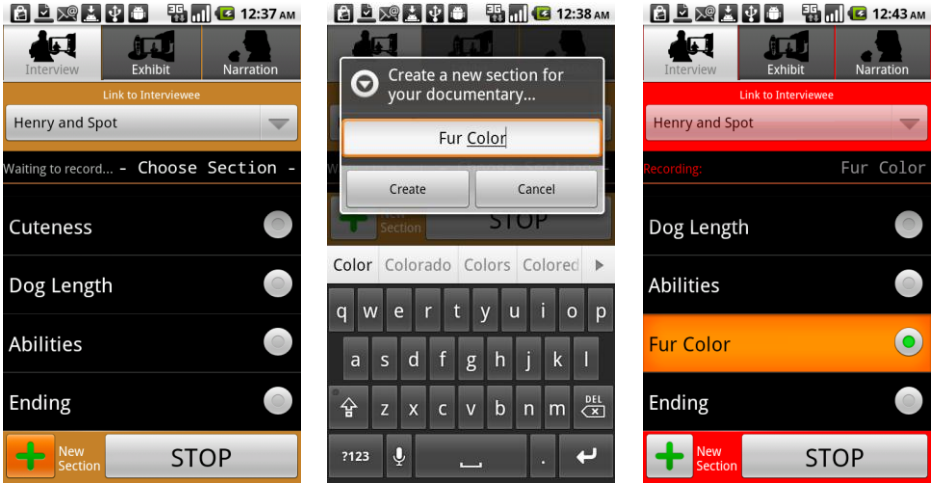




Similarly, Mariam's job of conducting the interview is made easier through this division of labor. To provide real-time annotation of the footage being recorded by Andy's continuously recording camera, Mariam simply taps the tag in the list corresponding to the topic being discussed by the interviewee. If the subject, for instance, begins by discussing his relationship with the pet dog, but then immediately start talking about what factors affect how cute the dog is, Mariam simply taps the "Cuteness" menu item, and a the video being recording during this time is automatically categorized into the "Cuteness" section and linked to the subject, "Henry and Spot." While footage is being annotated, the theme of the user interface flashes bright red to indicate that virtual clips are being recorded.

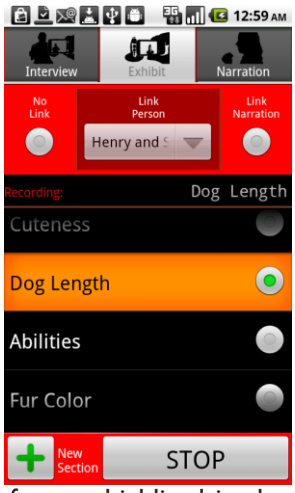
During parts of the interview that the documentarian wishes to leave out of the final product (such as when she is asking the subject a question, or there is a lull in the conversation), Mariam presses the large, "Stop" button at the bottom of the interface. This returns the interface to the standard "Waiting to record..." color scheme. If something terribly important happened to occur while Mariam's annotation device was in this not-recording mode, the continuously recording camera will still capture the footage, it will just not be automatically included in the final project, and this missing segment will just have to be inserted manually. Thus no permanent damage can be done by the annotation system and further pressure is removed from the documentarians. Since Mariam is not faced with the worry of how the subject is being framed and captured, she is able to focus more on engaging the interviewee and getting the best overall interview. The act of tapping between different sections was minimally obtrusive, and was actually found to be helpful, as the list of sections serves as question prompts for the interviewer.

If the person being interviewed begins to discuss a topic outside of the pre-established sections, such as "Fur Color", Mariam, the annotator, can quickly add this new section and begin annotating.



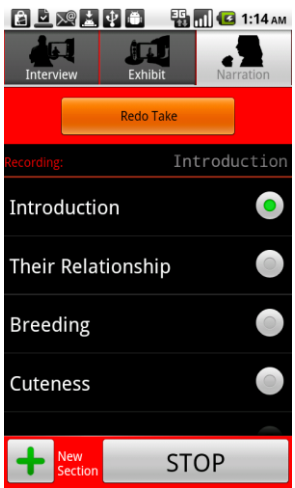
Note that Interview footage is always tied to a specific person (in this case "Henry and Spot"). Each person interviewed on a project is stored, so that more footage can easily be collected from a person during continued interviews in the future. New people can also be added to the project's person database at any time.

After the interview is over, the documentarians decide that they want to collect some footage illustrating some of the abilities and attributes of the pet that were described by the owner. While Andy, the recorder, films close-up shots of the dog performing various activities, Mariam switches the interface to the "Exhibit" tab and starts annotating this footage as part of the "Abilities" section. Then, Mariam asks Andy to get an overhead shot of the dog, and she selects the "Dog Length" section.

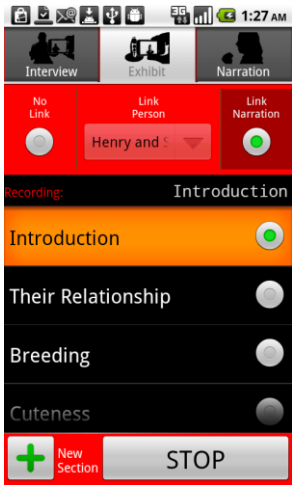


During this time, Mariam has the "Link Person" feature highlited in the Exhibit pane. This means that these collected exhibit clips will be grouped near the interview that was previously performed, instead of being paired with the narration for the section (as in the "Link Narration" case) or just being loaded at the end of a particular section, (as in the "No Link" case).

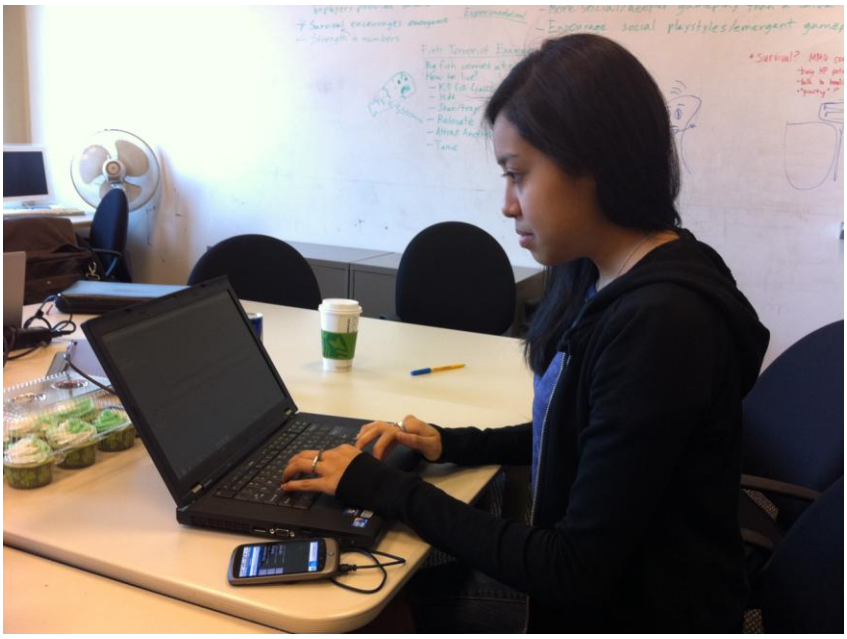
The duo continue to collect interviews and exhibit footage in this manner until they feel they have captured enough. Mariam did not want



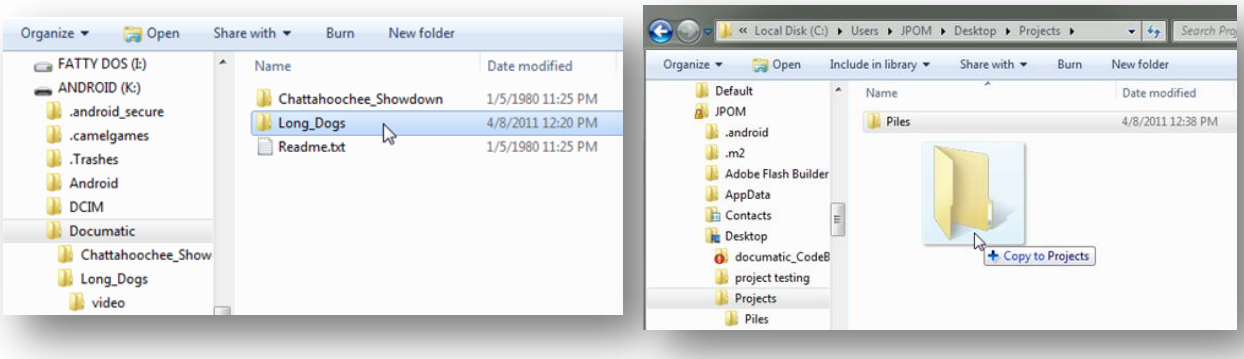
to have narration throughout the film, but did feel that there should be a simple narrated introduction that explained the purpose of the film. Now, while Andy records her voice, Mariam simply switches to the "Narration" tab and selects the "Introduction" section to begin recording a virtual clip. Since narration tends to be a much more rehearsed and scripted portion of a documentary, there exists the option to overwrite and restart a "Bad Take." This simply erases the previous virtual clip, and begins recording a new one for the same section. The purpose of this feature is to allow the documentarian to rehearse their narration live until they record a good take and not have to worry about sorting through lots of bad takes later. In order to collect some illustrative footage for this opening narration, Andy films establishing shots of people walking through the park with their dogs while, in the "Exhibit" tab Mariam selects the "Link Narration" option and starts recording a virtual clip in the "Introduction" section.



POST-PRODUCTION: AUTOMATIC PRE-EDITING AND REFINEMENT



Whether the team is prepared to produce finalized, distributable video, or they want to get a quick feel for how the video is coming together, the post-production process is made simple with the Documatic system. First they connect the android device to the editing computer, and copy



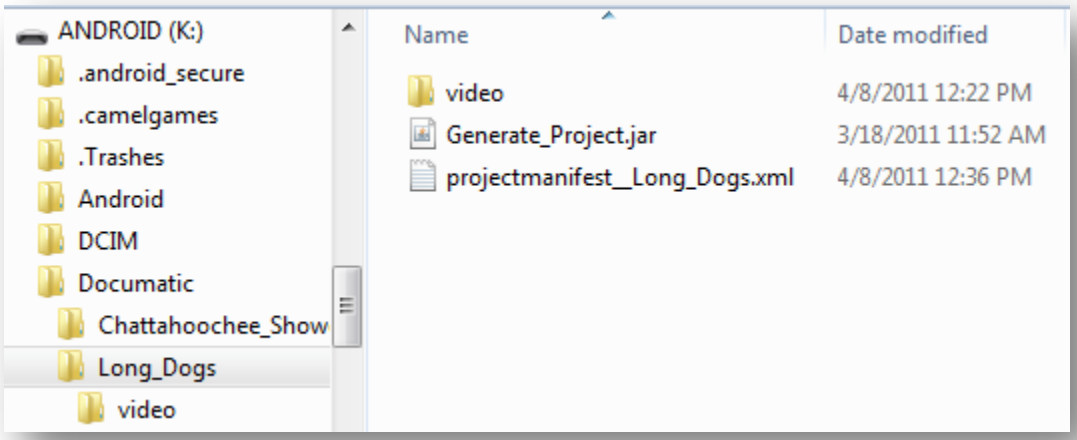
the desired project folder from the Documatic directory on the device to the computer.

Documatic's file system is structured as follows:

ANDROID_DEVICE/
    Documatic/
        - Readme.txt
        PROJECT_A/
            - projectmanifest__PROJECT_A.xml
            - Generate_Project.jar
            video/
                RAWVIDEOFILE_536.MOV

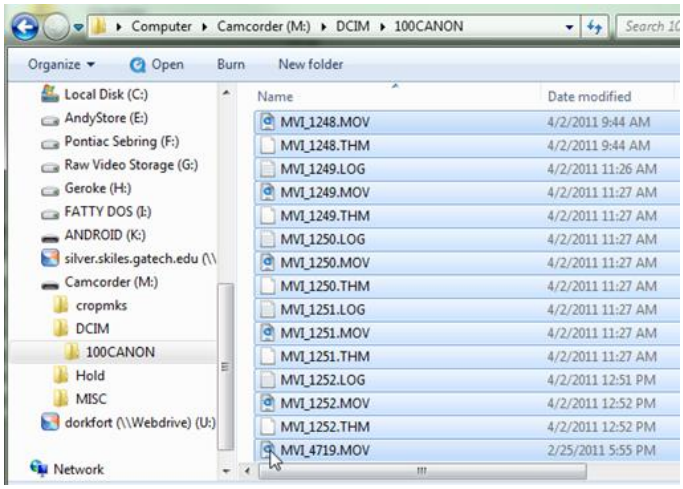
RAWVIDEOFILE_486.MOV

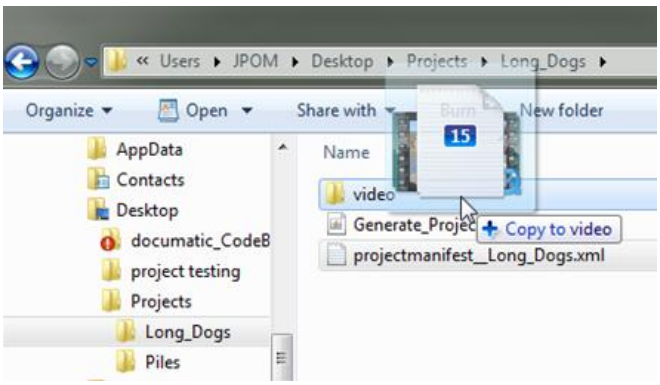
Each project folder contains all the information necessary to edit. share, and generate a single documentary. Each project folder has three primary components:



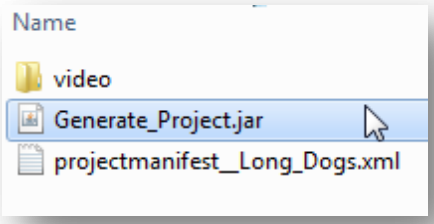
- a "projectmanifest__PROJECTNAME.xml" file which contains all of the virtual clip annotations arranged inside a structured xml tree
- a "Generate_Project.jar" file which, when clicked, executes the Project Generator program to automatically build a pre-edited sequence
- and a "video" directory which will hold all of the gathered footage.

Next, Mariam copies the collected footage from any of the cameras into the "video" directory located inside the project folder.

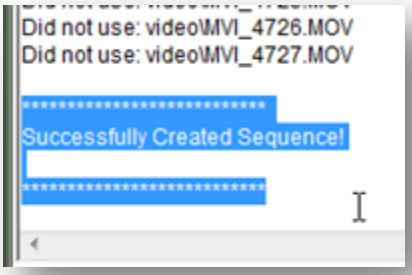


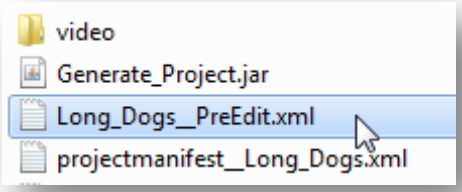


This is the location where the Project Generator will search segments of raw video to find matches for each of the virtual clip annotations. Now, all she has to do is double click the automatically included "Generate_Project.jar" file, and a new sequence is generated as a project readable by Adobe Premiere or Final Cut Pro.

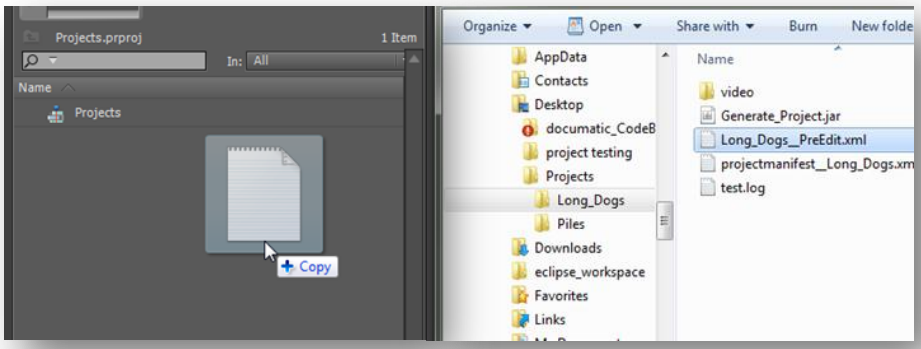


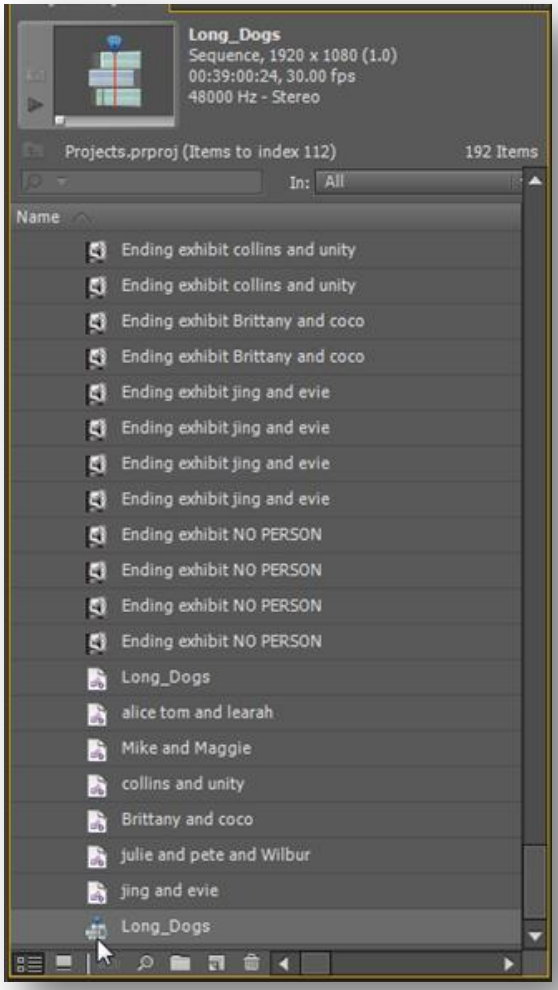
This file automatically appears in the main project folder and uses the naming convention, "PROJECTNAME__PreEdit.xml" (in our sample case it would be "Long_Dogs__PreEdit.xml").

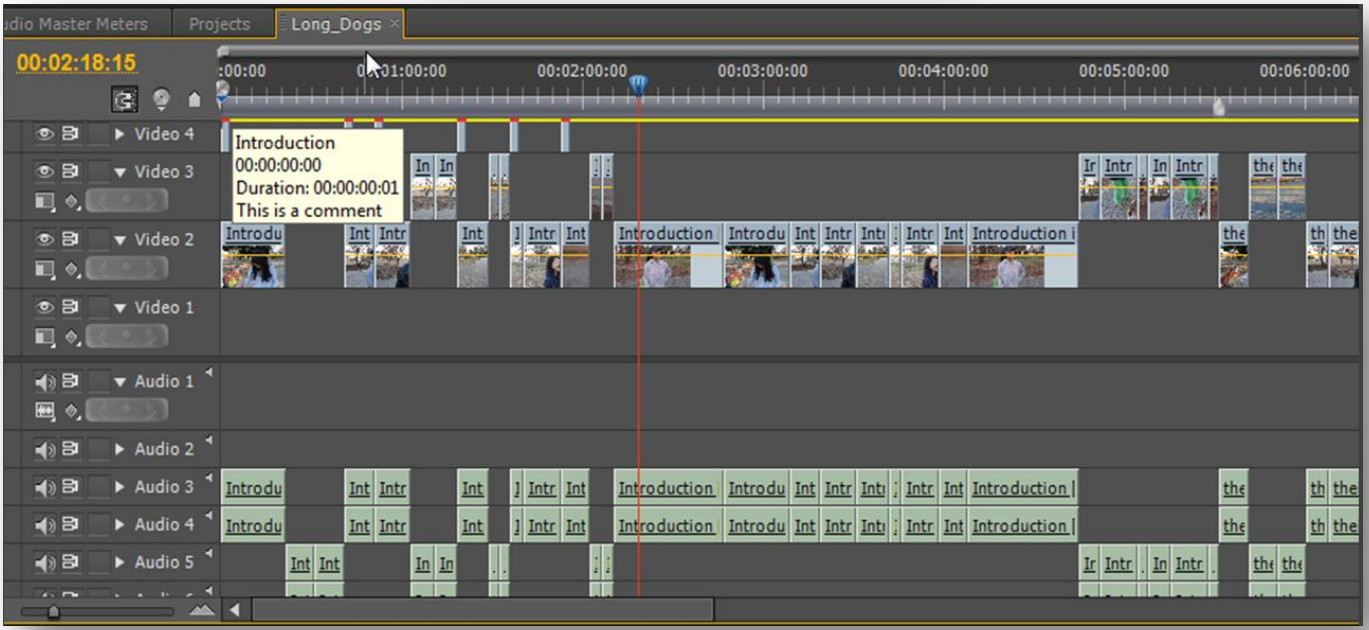




Finally, Mariam drags this pre-edited sequence into Adobe Premiere to see how her project turned out, and to provide final sweep of editing or trimming to the clips.

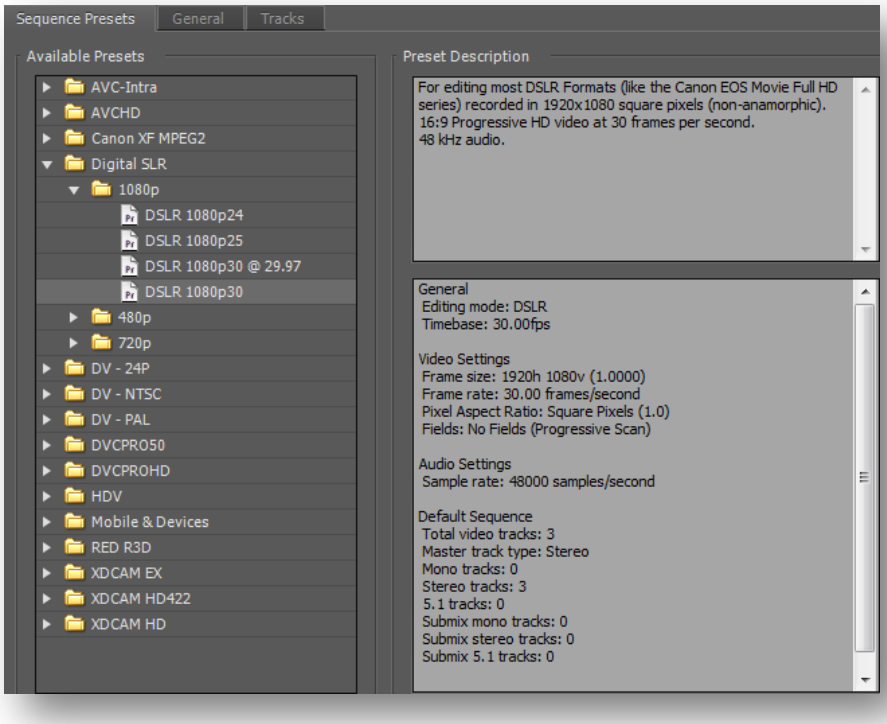



Long_Dogs
Sequence, 1920 x 1080 (1.0)
00:39:00:24, 30.00 fps
48000 Hz - Stereo
Projects.prproj (Items to index 112)
192 Items
In: All
Name
Ending exhibit collins and unity
Ending exhibit collins and unity
Ending exhibit Brittany and coco
Ending exhibit Brittany and coco
Ending exhibit jing and evie
Ending exhibit jing and evie
Ending exhibit jing and evie
Ending exhibit jing and evie
Ending exhibit NO PERSON
Ending exhibit NO PERSON
Ending exhibit NO PERSON
Ending exhibit NO PERSON
Long_Dogs
alice tom and learah
Mike and Maggie
collins and unity
Brittany and coco
julie and pete and Wilbur
jing and evie
Long_Dogs


Projects
Long_Dogs
00:02:18:15
00:02:00:00
00:03:00:00
00:04:00:00
00:05:00:00
00:06:00:00
Video 4
Video 3
Video 2
Video 1
Audio 1
Audio 2
Audio 3
Audio 4
Audio 5
Introduction
00:00:00:00
Duration: 00:00:00:01
This is a comment

EDUCATIONAL ABILITIES

One concern that arises is that Mariam has very little experience with Software Editing systems like Adobe Premiere or Final Cut Pro. This has posed a source of great difficulty in the past in the few times she has attempted to create an entire editing project from scratch. Before she could even get to the point of editing any of her footage, she would have to set up the initial parameters of the project with arcane names such as "Pixel Aspect Ration" or "Field Preference". Then she would need to know how to correctly import, organize, and arrange her footage into a sequence before she can even begin even an initial round of editing. In fact, Mariam described the setting up of a new project from scratch as one of the most "impenetrable" and "daunting" tasks in digital video editing.



Instead, with Documatic, even if she has never digitally edited a project before, she can employ her tacit knowledge of video clips as a sequence of frames, to trim, expand and move clips around her sequence. Documatic analyzes the raw footage stored in the "video" folder and determines a appropriate settings for an editing project. Then it automatically generates a project so that when it is opened in Adobe

Premiere or Final Cut Pro, the user can immediately begin the task of moving and trimming video segments. By permitting the interactor to "jump-into" the middle of an already established project, he or she can learn through exploration, instead of memorizing a series of rote tasks necessary just to get started.

Furthermore, while the automation of these video editing initialization processes is a boon to video editing novices, power users, like professional editors, maintain full agency to change project parameters. Any parameters set by Documatic can be easily undone be an experienced user, and since the editable clip segments that Documatic automatically arranges are merely references to the actual files, the captured video content is never altered whatsoever.

PROJECT COLLABORATION AND EXTENSION

The Documatic system is not a unidirectional process. Instead, it harnesses Murtaugh's concept of the "Evolving Documentary" to permit Documatic documentarians to iteratively augment and share their works.

Project Continuation

After the first day's filming, for instance, Mariam, auto-generated her Documentary, skimmed through this rough-cut, and decided she wanted to collect another day's worth of interviews. She and Andy return to the park, and while Mariam keeps annotating with the same Documatic project on her phone, Andy has brought a different video camera. Of course, since all references between clips are made with universal time stamps, the use of an entirely different video camera does not affect the functionality or workflow in the slightest. The two simply record and annotate as before. When they get back to the editing computer, they add the new video files to the "video" folder, and copy over the new "projectmanifest" file. Now they just re-run the "Generate_Project.jar" file to create a new rough-cut sequence which includes both days' footage.

Project Merging/Single Person Filmmaking

Documatic also features the ability to intelligently merge projects filmed entirely separately. For example, one day during the production of the dog documentary, Mariam was unable to make it to the park to record interviews. This posed two budding difficulties. First, Andy was going to have to record and annotate several interviews by himself. While Documatic was designed to split the production process between two or more individuals (an annotator and a recorder) in order to lighten

the Documatic mode of production, it is still very much possible to use the system solo. Andy mounts the camera onto a tripod, and leaves it recording the entire time. Then, during interviews, Andy just has the person stand in front of the camera (with their dog), while he annotates their interview on his phone.

FIGURE 7 - DOCUMATIC SINGLE USER CASE (USE TRIPOD)

The second, and potentially more difficult problem was that Andy did not have the original phone Mariam' was using, or even a copy of the project containing all the previously set sections and annotations. In the park, he sets up a new Documatic project on his own phone, and begins adding and arranging sections. He remembers that Mariam's project, which was structured like this:

Introduction -- Their Relationship -- Breeding -- Cuteness -- Dog Length -- Abilities -- Ending

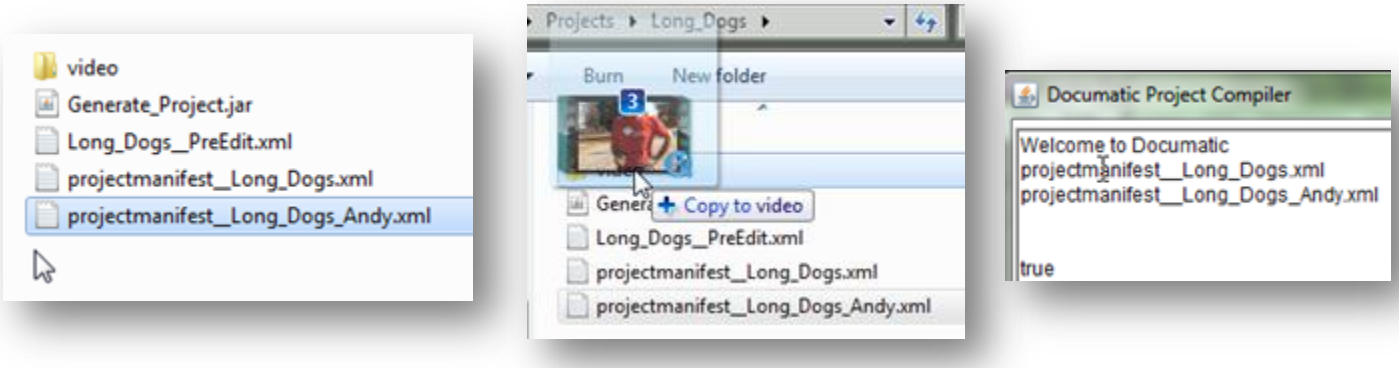
began with an Introduction and a section about the Owner-pet relationship, but the only other sections he remembers are "Dog Length" and the "Ending." Additionally, he adds a section about the dog's typical meals titled, "Diets." Thus Andy's project was structured like this:

Introduction -- Their Relationship -- Diets -- Dog Length -- Ending

Using the tripod to help record, Andy captures a day's worth of interviews and narration footage into his project's structure. At this

point, Andy could just treat his day's filming as an entirely separate project, auto-generate it's Adobe Premiere sequence, and then manually insert the pieces into the correct locations in Mariam's previously created sequence clip-by-clip. This type of tedious manual labor, however, partially undoes Documatic's original goal of streamlining the overall production cycle.

Instead, Andy employs Documatic's built-in project ability to automatically merge disparate projects. To do this, he just copies the content from the new project folder, "Long_Dogs_Andy " into the original project folder, "Long_Dogs."



Both sets of raw video will now be stored in the same "video" folder, and Andy simply runs the "Generate_Project.jar" file. This creates a new "Long_Dogs__PreEdit.xml" sequence from an intelligent meshing of the two projects. Any clips that Andy recorded to sections matching those of Mariam's initial project, are incorporated into the correct spots of the sequence as if they had actually been shot with the original footage. Any conflicting sections between the two projects are added to the sequence as an separate element. Consequently the structure of the final, merged project appears like this:

Introduction -- Their Relationship -- **Diets** -- Breeding -- Cuteness -- Dog Length -- Abilities -- Ending

The amount of projects that Documatic will intelligently merge is limitless since the Project Generator only seeks files that *begin* with "projectmanifest".

Project Sharing and Passing

Since the Documatic production process is based on structuring the collected footage in a meaningful way, it can be much easier to share or pass along a documentary project with other filmmakers. Let us say that Mariam had a friend named Kathleen who was doing an separate, larger, documentary project about people and their pets in general. Mariam could share her

She does not have to leave Kathleen notes about what video files correspond to which sections, nor a list of all the people who were interviewed. Most of the salient information needed by Kathleen to incorporate chunks of the Dog Documentary into her project, is provided by Documatic's human-readable data fields. Kathleen can simply open both projects in Adobe Premiere, find interesting sections, and copy and paste them into her larger projector if she wanted to include all of Mariam's footage into her final project, she can just let Documatic merge both of the projects together.

Furthermore, if Mariam had only started making the Dog Documentary, but was unable to complete it because she had to get back to work on her thesis, she could pass the digital folder containing all her information collected thus far to a new person who will take over and finish the project for her. This person can just load Mariam's folder onto his or her phone, customize the project how they see fit, and then finish collecting whatever additional footage they desire.

REVIEWED USE CASES

As part of the analysis of Documatic's performance, and to enhance and refine the product's overall design, I have reviewed some select cases where my project has been tried out by independent practitioners. After creating a first, functional prototype, I analyzed the App's use by persons of various skill sets, and filming contexts. First I began by studying the most "powerful" user, myself. I took the system, and used it solo to film early sequences for the prototype documentary, "Long Dogs." here are some of my personal, running field notes from the process:

2/23/2011
First field test on project, "Long Dogs."
:Single user (me),
:External camera,
:1 establishing shot from phone (not connected)
-**Found that changing view from portrait to landscape stops clip recording. Should lock orientation!
-Overall did not seem much easier in terms of shooting. In fact, since I was shooting by myself, it forced me to use a tripod (which can be a good and bad thing) since I had to hold the android phone). It would be very hard to shoot hand held video (especially with my DSLR) while annotating on the phone. Might be easier with two phones.
-Greatest perk for the single user seems to be that the video annotation system functions in parallel as an interview

2/25/2011
Notice that in the FinalCutProwriter function, if a section has no elements, the section markers will write at the same location in the timeline causing errors. -Fixed!

Found memory leak in FinalCutProwriter. If there are too many videos it crashes! -FIXED!

After my personal examinations, I took a look at the system's use by a friend, Mariam, who took over the creation of "Long Dogs." She performed both the roles of "recorder" and "annotator" with minimal initial interference from myself. She also went through the final stages of collecting the footage, automatically generating a project, and polishing edits in Adobe Premiere. Here are Mariam's personal responses to her experience with this system:

Please briefly explain your understanding of the Documatic System functions:
The Documatic System (DS) helps aspiring documentarians streamline their work-- particularly the editing process-- by better structuring and organizing their recordings.

What kind of work do you typically do?
Graduate Student/Ethnographic Researcher

How do you feel about the methods of recording in the Documatic way, vs. recording with a simple camera
What I like is that the DS requires the documentographer to have their work organized before they start. Even though I'm a pretty big film amateur, I know that organization is pretty key (what questions to ask, what scenes to shoot, etc.). A regular camera is just linear and the documentographer has to extract elements afterwards.

Have you ever participated in shooting a documentary before
Yes, by simply recording performances, plays, or sporting events, Somewhat, in just videorecording things with friends

How difficult was it for you to combine the recorded footage and generate the Adobe Premiere Project?
easy peasy! i'm assuming there's going to be some written documentation (like a readMe or something) that will explain the steps I need to take (as opposed to you telling me what to drag and where) super easy! 11! i'd give you a 12, but there are some weird Premiere things you can't override. if you could rename the layers in Premiere ("exhibit footage," etc.), then you'd get like a 13

How were you able to navigate the User Interface
you already know this, but I kept forgetting to label footage with people's names. also, it'd be nice to delete categories, but the reordering mechanic is pretty sweet!

How do you feel about the way that your project was edited together?
Sometimes I would move on to the next question in the interview, but the interviewee would say something that was related to a previous question. I'd have to backtrack and retap a category I had already annotated, but I don't know if that messes anything up since I haven't done the Premiere part yet.

Briefly describe your understanding of how and what the annotator does
The annotator sets the categories for the documentary and is also responsible for switching to them while the interview is conducted and recorded. She does this by simply tapping the buttons that correspond to the categories she has created prior to recording, such as "introduction," or "why did you choose x over y?" She also switches between types of shots (interview or exhibit) and makes sure that the footage is correctly labeled with and categorized by the interviewee's name.

Describe your experience interviewing people while annotating video
Once the categories were set up and the interviewee's name was entered, annotating the video was extremely easy. It was simply a matter of tapping the correct (and clearly labeled) button when I asked each question. The large, clearly legible labels are important because it minimizes the time my eyes spend on the app and allows me to maintain eye contact with the interviewee, which I think is crucial to a successful interview.

Comments
-you already know this, but the colours: because "STOP" was red, I thought it was recording -I'm biased because I own an iThing, but my impulse is to swipe to the right to delete things

Here is the set of my field notes from the period when Mariam was using the tool:

2/25/2011 -afternoon
Second field test on project, “Long Dogs.” Mariam Shooting video, Andy Annotating
-UX consideration, (at least while shooting on my own) it can grow tiresome to go back to the ADD FOOTAGE panel every time when switching between from INTERVIEW to NARRATION. Maybe there should be a standard swapping from right to left to navigate different types of footage

-- I think that the narration part can be done just as easily Solo as it could with a second person helping to film. So maybe we should add a feature to narration for recording virtual clips simultaneously with actual audio.

-- During the first interview Mariam, instinctually filmed wherever the action was. That is, when the person talked, she pointed at their head, but when the person pointed to his or her dog, Mariam pointed the camera away from the interviewee and towards the dog. She did not know that we would get separate shots of the dog later
Moral: Scripting the Recorder is just as important!

3/2/2011
-Figured that the interactor needs a bit more information when it is time to compile their footage:
ADDED- Readme file that get bundled into each project
ADDED- Printlog that displays in a java frame when clicked

3/7/2011
-Per Mariam's suggestion, made this part more salient
****
Successfully Created Sequence!

****

3/10/2011
-Discovered that if the user does not close the Java window, and they try to run the generate project a second time, it will fail
FIXED- added an auto close with a beep!

3/17/2011
-Realized that just calling every project’s manifest file, “projectmanifest.xml” was a bad idea when merging projects!
FIXED-labeled projectmanifests with the actual project names.

Since Mariam was a semi-novice, when it came to filming documentaries and editing video, I looked for feedback from a professional filmmaker who was experimenting with the system to see how the system stacked up against the methods of large studios. He began using the system, after I made many of the design changes suggested by my and Mariam's experiences. Overall his response was quite enthusiastic. Here is a summary of his responses:

Please briefly explain your understanding of the Documatic System functions:
It's a system for logging and organizing video footage on the fly during the actual shooting. By synchronizing the time of day between the camera and one's android phone or tablet, one can mark the beginning and end of particular shots and organize them according to type of shot and thematically where it fits in the story. The program then exports this information and uses it to set up the corresponding clips in a Premier Pro timeline, ready to edit.

What kind of work do you typically do?
Freelance Camera Assistant, Operator

How do you feel about the methods of recording in the Documatic way, vs. recording with a simple camera
Using the Documatic doesn't really change the way in which I would shoot a documentary project, but it does help organize information during shooting. Without the Documatic process, there would be a lot of extra time spent trying to organize all the video footage after shooting. The only extra thing to do during shooting is have the app open and notate start and end times as clips are being shot.

Have you ever participated in shooting a documentary before
Yes, at a professional level, Yes, at an amateur level, Yes, by simply recording performances, plays, or sporting events, Somewhat, in just videorecording things with friends

How difficult was it for you to combine the recorded footage and generate the Adobe Premiere Project?
-i'm going to play devil's advocate because I can imagine someone asking you this: it seems like the app itself is targeted at documentary noobs, but then the footage is imported into premiere, which seems like it's for experts. are you expecting your users to be familiar with premiere, or are you trying to encourage this, or...? I was following directions to generate the Adobe Premiere project, but it was a simple set of steps, and after a few more times I would probably be able to do it without following directions. It was really just a matter of dragging and dropping a few files. The footage took 5-10 minutes to transfer, but that varies anyway based on the amount of footage.

How were you able to navigate the User Interface
The user interface was very intuitive. It took me less than 5 minutes to get a feel for the structure of the app and figure out all the functions.

How do you feel about the way that your project was edited together?
People tend to have different ways of organizing and editing footage, but I can see this being a good starting point for editing a project. Having the footage in a timeline already can be a good motivator to get in and just start messing around with the footage. The only big improvement I could see would be to create a set of subclips for the marked footage that would be organized in the footage folders, much in the same way that the annotator organizes information in the app. That way you wouldn't be dependent on keeping the footage in the timeline to keep it organized.

Briefly describe your understanding of how and what the annotator does
The annotator is essentially an organizer for footage. It keeps track of the time of day, as synced with the camera. It uses a simple folder structure to create categories of footage. Then, during shooting you hit start and stop to mark the beginnings and endings of footage.

Describe your experience interviewing people while annotating video
Once I was set up in the particular "interview" category, it was a simply a matter of hitting start as I finished asking a question to mark the actual moment of a person's response. I could then easily change subject between questions depending on what I was asking

.

ITERATIVE EVOLUTION: *THE DEVELOPMENT OF THE DESIGN*

From findings based on my and other's experimentations with my system, I have performed several iterations influencing Documatic's underlying functionality and user experience.

DOCUMATIC INFRASTRUCTURE

One of the primary discoveries made during the design process of Documatic was the value in exploiting the unique timestamps. In the initial phases of the design, I put much focus on determining the optimal way to directly communicate and pair the semantic data of the annotations with the raw data of the video files in real-time. Several different systems were designed to use either Bluetooth or network communication to share these two sets of data between phones. First a set of Android phones would be paired together. One phone would then use its camera to record, while the other phone communicated real-time annotations to pair with the video being captured.

Direct Connection

This direct-connection system posed several problems. First, the video quality of even the best android phone, pales in comparison with professional video cameras. Second, there may be synchronization issues if the phone capturing the video information and receiving the annotations has a processing overload, and delays the application of certain annotations. Third, if the system is to be expanded later to include either multiple video recording phones, or multiple annotating phones, much of the framework will have to be rebuilt to accommodate these new features. The largest problem, however, is that by relying on a direct connection, the documentarian team always runs the risk of losing information. If the connection between the phones fails during an important interview, or event, this precious information may be lost forever. This would directly contradict the semi-automatic filmmaking design goal of "Independence" established earlier for this system.

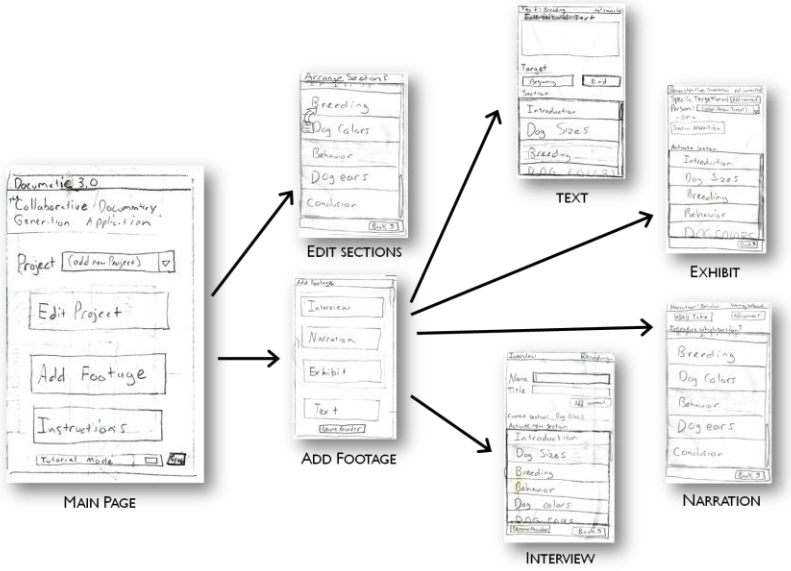
Indirect Connection

So instead of relying on the direct communication between the phones, it was decided to pair the data based on universal timestamps. Since, every video recording is already, inherently linked to a specific, unique moment in history, it would make sense to treat them (and the annotations) as so. Then, by having both the recording and annotating systems connect indirectly via the persistent, perpetual flow of time, we can break free of any network communication limitations. Additionally, we would now be free to use *any* digital recording device (based on a video file's duration and "date modified") instead of relying on the poor video quality of mobile devices. Now the filmmakers need only

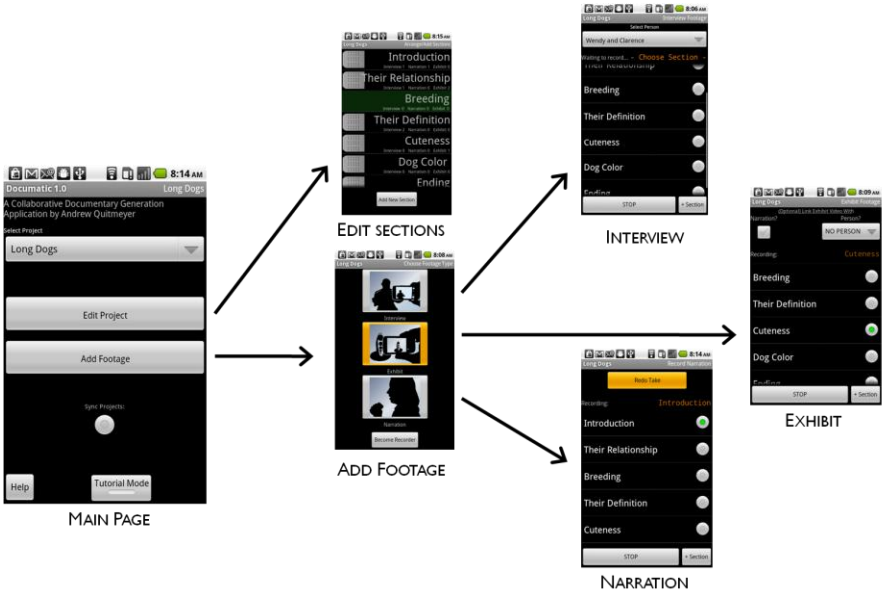
synchronize their digital cameras and phones with the Universal Time Protocol (UTP) in order to link data.

In this way, the annotator is no longer making notes for a specific video file, but in fact, as specific moment in time. This leaves the system completely open to work with video coming from multiple sources simultaneously (discussed more in a later section).

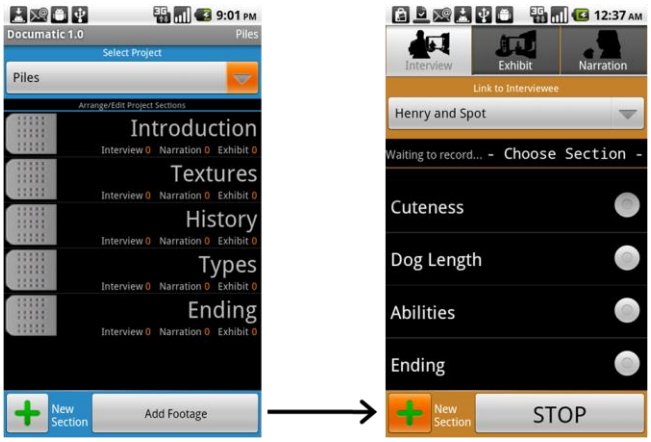
USER INTERFACE CHANGES



An initial user interface was created as a modular network of views that tested the functionality of particular features in the early stages of Documatic. This primarily served as a debugging interface which allowed me to quickly identify and modify different features. When I began testing this interface with real-life interviews, the main problem that occurred was that there was too much down time spent switching through the different views and it made it hard to keep up with the interviewee.



After reviewing several use-cases, I have streamlined the user experience, and made all the tools necessary to conducting and annotating an interview much more quickly accessible.



MAIN PAGE/PROJECT EDITOR ADD FOOTAGE

Based off the recommendations of several sample users, I have also made additional features such as the ability to delete a section by performing a long click, and keeping the selected person persistent between "interview" and "exhibit" views footage about that interview.

FUTURE ADDITIONS

Real-world examination also opened my eyes to many simple future additions, such as automatically generating a credit roll with the names of the interviewees. Another impediment for initial users of the Documatic System, is that they must install the external application Xuggler. Xuggler, is a free software library that reads the information from the video files, and accept a variety of different formats. A problem with Xuggler, however is that it is not self-contained, so the users have to separately install this program, outside of installing Documatic. This could theoretically be fixed by using a built in Java Media Framework or JavaFX, but I have had little luck using either of those products for my project.

Right now, Interview, Exhibit, and Narration footage are placed in separate layers, but are not overlaid. I did this because my attempts at

directly overlaying the separate layers sometimes made the pre-edit too messy, and the editing process got more complicated. It could be beneficial, however, to include the choice as to how much the clips are auto-edited.

Some other features that would be nice to include, or at least postulate, are: the ability to integrate and tag found footage, and the ability to preview the rough-cut entirely on the phone.

KNOWN BUGLIST

In my experience programming to share media across multiple, complex systems, I have uncovered several issues which deserve future attention.

Final Cut Pro Compatibility

The current Project Generator produces pre-edited footage that creates errors when the project is imported into Final Cut Pro. No problems occur when using Adobe Premiere. This is quite frustrating because the XML being generated is based directly from a Final Cut Pro XML file (not an Adobe Premiere file!). My guess is that this has something to do with differing file path conventions between PCs and Macs.

Small, Misplaced Titles

The manner in which I generate text for the sequences yields predictable results in Final Cut Pro, but when these same sequences are brought into Adobe Premiere, the titles lose the formatting of their position, size, and font. The position and size can be easily corrected by applying a single effect to the bulk of the titles, but changing the font directly requires more effort. Deserves further investigation.

VI. EXTENSIONS

Since I left Documatic's underlying framework to be based off universal timestamps, there are several ways to extend the system to encompass a wide variety of additional features and uses.

Multi-Camera / Single Annotator

The current system places no limits or assumptions on the amount of video data files that could be referenced by a single annotation. It merely searches the "video" folder simple to turn this system into a massively multi-camera system. This is a scene from a Beastie Boy's documentary where they gave everyone in the audience camcorders to film the show. You could have one director annotate the entire show, and the Documatic system could automatically synchronize, segment, and group this massive amount of raw video data directly into a digital editing timeline, and let you effortlessly browse between the various camera views.

Multi-Camera / Multi- Annotator

Growing even more enterprising, for large events, like a political protest you could have an indiscriminate amount of people, filming and annotating throughout the day. Then they could separately upload these video files, and time-stamped XML annotations to a central server, and

interesting views of the day could be automatically generated representing individual or merged experiences from the group as a whole. The film, BURMA VJ (http://burmavjmovie.com/), was shot by collecting lots of secret, camcorder and cell phone video of government misdeeds and protests which had to be smuggled out of Myanmar. The people in charge of editing together all of this smuggled, unorganized footage, could be helped out immensely if the time-frames and locations where the video was shot were annotated.

More procedural models

The most important feature of this product, is that we finally have a video production system that is actually digital all the way through. The digital documentary, is just one possibility, but by simply creating a procedural model of a different cinematic genre, you could easily beginning producing digital, semi-automated Sitcoms, Thrillers, or Dramas. In fact, we could create a procedural model creation system, where users generate their own rule-sets of custom complexity. The important thing here, is that we are treating video in the same way that a web developer treats documents of text and images. By pairing annotation with video, and forming intelligent rule sets, we can make the labor intensive video-editing process, as simple as changing Wordpress templates.

Model Creation system

In extending the project to harnessing multiple procedural models, the most helpful tool would be a user accessible Model Creation system. That is, when they begin a new project, instead of just specifying a project name, they would also choose what procedural model this project would follow, or they could have the option of designing a new one on the fly. Instead of working with the same elements of "Interview" "Exhibit" and "Narration" used by the Documatic model, the interactor

could have the option of designing their own elements and specifying rule-sets for each.

Standardized, Searchable Video Depositories

If the amount of documentarians embracing the Documatic system reaches high enough levels, repositories could be established where video producers could share and search for annotated footage.

VII. CONCLUSIONS

The most important aspect of Documatic is that it provides a complete workflow for using video data procedurally. In the words of a colleague, "It finally treats video in the same way that a web developer treats documents of text and images."

VIII. DELIVERABLES

On April 14, 2011, I will submit the following deliverables to my thesis committee:

- The foundation for a digitally remediated form of documentary film, Documatic's procedural Model.
- A functioning Android application (the artifact) that permits users to annotate video in parallel with its recording and then generates rough-cut "pre-edited" footage sequences for Adobe Premiere.
  This will feature a(n):
  - Interface allowing users to create and edit narrative/ categorical structures for their documentaries.
  - Interface letting a user (the annotator) temporally tag sections of a video in real-time.
  - Interface permitting the user to dynamically re-arrange the combined video and category structure.
  - Final Cut Pro/Premiere (XML)project generator based on the coded structure of tags, metadata, and collected video footage.
- Documentation describing the artifact, its creation and the theory leading to its creation.
- "How-to" help documentation for users.
- Analysis of.

Future Possibilities:

- The ability to integrate non-smartphone cameras (such as professional HD camcorders).
- The ability to use an indeterminate number of cameras, simultaneously for a multi-camera shoot.
- Live-casting ability for multiple cameras and a "director"
- Integrated diagram creation tool (for works like scientific documentaries).

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The Dorkfort

Kitty Quitmeyer

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