

Midterm Project Report:

Film Production

Contextual Inquiry



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A. Executive Summary

Application Domain

Our application domain is filmmaking. With the inherent complexity and the many different parts of filmmaking can lead to breakdowns in the field which can lead to delays in the filmmaking process. This slowdown can lead to breakdowns within the production with the different crewmember or clients becoming frustrated. Our goal is to improve the filmmaking process.

Unmanned Aerial Vehicles or UAVs are aircrafts that are used generally for military applications but now are seeing use in commercial and consumer domains. Smaller and more portable UAVs, also called Drones, are such devices that are now being used in applications such as photography, surveillance, reconnaissance, etc. The focus of our project is the use of such Drones in the field of Videography, specifically in film making. We aim to find out the novel ways in which these UAVs can be put to use to aid filmmakers and how they could augment filmmaking capabilities.

Data Collection Methods

Our Project involved observing the setup, production and post-production activities that take place during filmmaking projects. This included observing all activities related to videography, light and sound, Computer Graphics, and the synchronization between all these various aspects of the filmmaking project.

We observed the behaviors of the various people involved in the activities, their routines, and the procedures that were involved. We conducted interviews to gather more information about the various issues encountered while conducting activities pertaining to filmmaking. The constraints they had to work within were of importance to us. The observed environments consisted of film sets, office spaces, and Post Production facilities that had computer workstations.

Data Analysis and Design Ideas

We took note of all the artifacts used, and the methods involved with using them. Contextual notes were taken, and diagrams were made, which were then consolidated. Based on the information gleaned from the aforementioned diagrams, we envisioned certain designs and a storyboard was created collaboratively.

Project Scope

Stakeholders

The primary stakeholders of our systems would be videographers and filmmakers. Those interested in getting into the field of videography but lack the means or the access to advanced level equipment are considered as well. This system is also for the ones who seek to incorporate the newest technology and want new methods of filmmaking in terms of the new capabilities that this system would allow.

Existing Systems

The contextual inquiry that we conducted hinges upon the study of current systems, as we aim to create a solution to augment or enhance the capabilities of these filmmakers. We studied the current systems, the equipment and the usage of the same.

B. Introduction

The process of filmmaking takes many different parts and a lot of equipment to ensure that everything is correct. Within the film crew there are a lot of different positions but since we mainly concentrated on small crews we identified three main position cinematographer, sound recordist and director.

The cinematographer is responsible for everything pertaining to the camera set up and shot composition. Then the job of the sound recordist is to record all audio at the location with to ensure that there is not an excess of background noise that ruins the recording of the performers voice, which is the sound recordist, is trying to capture. Then finally the person who we are mainly observing is the director whose job is to overlook all the departments to make sure that everything gets done. We also had an opportunity to look at one more role within the postproduction process who was the visual effects (VFX) artist. The job of the VFX is to create special effects within a movie or to fix problems that happen during a production in the picture such as if a microphone gets into the shot they will remove it. Our goal is to simplify this process to make it easier on the crew members within this project.

C. Summary of Contextual Interviews

Summary of 1st Contextual Interview:

Location: Film Set (Apartment, Green Screen Room)

Type of recording: Not live, will be edited

Artifacts/ Equipment: Camera, Mic, Lights, light screens, slate (clap for scene start) app on iPhone, sheet for order of shots, tripod, slider.

Participants:

Participant 1 (Main Participant)

Age: 22

(Media arts and science student)

Position on set: Director

Participant 2 (Supplemental)

Age: 22

(Media arts and science student)

Position on set: Cinematographer

Participant 3 (Supplemental)

Age: 22

(HCI Masters student/ Media Arts and science student)

Position on Set: Sound Engineer

Main Summary:

Our team observed a director who was live on a film set. The general activities consisted of: preparation work (including setup and teardown), actual shooting, and discussion and coordinating effort between the team. Some of the first observations made were the setup process which included decision making as far as what the order of the shots would be for the shoot. This task was accomplished with all participants on the set collaborating in order to generate an ordered list of the scenes. Discussion then ensued about the lighting and continuity.

For each scene the camera is readjusted, team discusses light/ camera angles, lenses may be changed etc. After this, the director conveys idea for the shot. The whole team then discusses the feasibility and whether or not to take the shot. There are many fine adjustments that are then made before every scene (the whole crew including the director helps with this). Some of these fine adjustments included the proper lighting that depended on the time of day. This included putting up screen over windows etc. There were also adjustments with audio and color temperature as well.

There seemed to be a blend of roles on the set. All of the participants at one point or another helped the other participants with their role. The director worked on all of these roles at one point or another as well. They worked as a unit filling in role gaps when needed. Setup times varied from about 10- 30 minutes.

Later in the day the crew went to a different location in order to shoot some footage with a green screen. The green screen is used to supplement different background overlay scenes using some video editing and video effects. There was a quick workflow being that there was a time constraint with the green screen room availability. The director had to make quick decisions on what needed to be done and how given the time constraints. Some of the type of activities that were cumbersome in this situation where the angle of the tripods that needed to be adjusted manually in order to get the right speed. Focus also needed to be decided before filming started on these scenes. Below we have listed our key observations and findings as well as some possible solutions that related to this contextual interview.

Key Findings:

- The entire team discussed the feasibility of each shot, before *and after* every shot was taken, rather than having one main entity “calling the shots”, as this project had multiple “stakeholders” there was a discussion.
- Time was a constraint and the setup of the equipment takes a significant amount of time.
- Environmental factors such as lighting are beyond control and add to the urgency and time crunch.
- The flow of activities was quite nonlinear and the role assignment was quite flexible, although the activities followed a general structure on a macro level, on finer observation there were many smaller activities and discussions that cannot be concretely categorized.

Ideas:

- Providing ways to use/preview multiple camera perspectives and change them on the fly using software
- Ability to look at multiple angles at the same time
- coordination between UAV and land based cameras
- Advanced pan/zoom/etc. from software
- Waypoint and path based features for horizontal/vertical/arbitrary tracking
- Tracking shots of greater than or equal quality compared to land based sliding camera equipment

Summary of 2nd Contextual Interview:

Location: on-campus (Hine Hall in building foyer)

Type of recording: Live, will be edited

Artifacts/ Equipment: Camera, Lights, Microphones, cables

Participants:

Participant 1 (Main Participant)

Age: 22

(Media arts and science student)

Position on set: Director

Participant 2 (Supplemental)

Age: 20

(Media arts and science student)

Position on set: Cinematographer

Participant 3 (Supplemental)

Age: 21

(Media Arts and science student)

Position on Set: Sound Engineer

Main Summary:

Our team observed a director who was live on a film set, setup for an interview with a faculty member. The general activities consisted of: preparation work (including setup and teardown), actual shooting, and discussion and coordinating effort between the team.

We mainly observed the director but soon realized there were melding roles amongst the members. Firstly, everyone unpacked and started setting up. This included unpacking cables, cameras, lighting etc. The main director specifically unpacked audio cables, stands and helped mount lighting accessories. The whole team coordinated where to find a shoot location. At one point there was a problem with noise from a nearby water cooler. The director and the other two videographers discussed moving the set location and eventually came up with a solution to unplug the water cooler.

All three crew members on set coordinated over lighting issues. There were several suggestions and movements and the effort was coordinated evenly amongst all of the crew. The director helped videographer setup camera. There was a battery life issue with the camera. The director also helped with this situation. He also had to find extensions and power cables at one point in order to supplement power for the camera and lighting. They could not find a close enough outlet. At one point, one of the videographers mentioned that it would be nice to have a checklist for procedural stuff.

Everyone adjusted height of camera and lights in some final steps. Before the shoot there was a run through to make sure lighting is ok. Director looked at other videographers through camera lens to make sure lighting was correct. A quick mock run-through was done in order to make sure everything was set up correctly for the shoot. Shoot was the next step and was pretty straight forward with director operating the camera with record and stop.

Talking to them a few days after the interview we found out that they must redo the interviews since the lighting was off and the interviewee was not ready.

Key Findings:

- They had problems with lighting due to where outlets were located.
- Problems with finding a quiet area within the space they were filming.
- Battery life issue.
- Team just worked together without an obvious leader.
- Items that team forgot such as microphones and extension cords.

Ideas:

- Drone may be able to find quietest location for shoot.
- Drone actually does the lighting for the set (greater flexibility)
- Drone finds best lighting angles and reports back to the team with best location suggestions.

Summary of 3rd Contextual Interview:

Location: Office

Artifacts/ Equipment: Office Workstation; high resolution monitor, keyboard, mouse, Wacom Pen-input monitor

Participants:

Participant 1

Age: 32

(Media arts and science professor)

Task Duties: 3D animation and virtual set compositing

Main Summary:

Our team observed a 3D/special effects artist working on virtual sets and camera rigs set up to mimic the operation, and range of motion of their real life counterparts. Participant 1 had a folder hierarchy structure of different virtual sets and camera rigs associated with different projects he was working on. When switching projects, he opened the file associated with the project and scene in which he wished to manipulate. Participant 1 demonstrated the manipulation of three different types of camera rigs which included a tracked dolly, a robotic crane, and a parabolic slider. The cameras themselves could be moved in directions in which the rigs were constrained to, or they could be 'grounded' with an aiming point in which the camera would track according to its movements. Participant 1 emphasized the need for keeping camera movements grounded in realistic physics, as movements that are too fast, or could not be accomplished by a real world camera introduces 'chaos', disorienting to the viewer and distracting them from the narrative.

Participant 1 opened up a finished animation scene which included lighting, characters, and camera setups. The camera views and their associated movements were demonstrated to show how the cameras move within the scene to follow the characters and drive the narrative forward. It was noted that a mouse and keyboard interface type was the best method of manipulating scenes.

Key Findings:

- Mouse and keyboard was the desired interface
- Camera movements should be kept realistic
- 'Insane' camera movements cause chaos and interrupts the narrative
- 'Insane' camera movements include super-distance change in a short time, and multi-axis moves
- When executing extreme camera movements, it is best practice to do them slowly
- 'Drone' based cameras would be extremely useful for pre-visualization scene planning in which directors could get a sense of space on camera

Ideas:

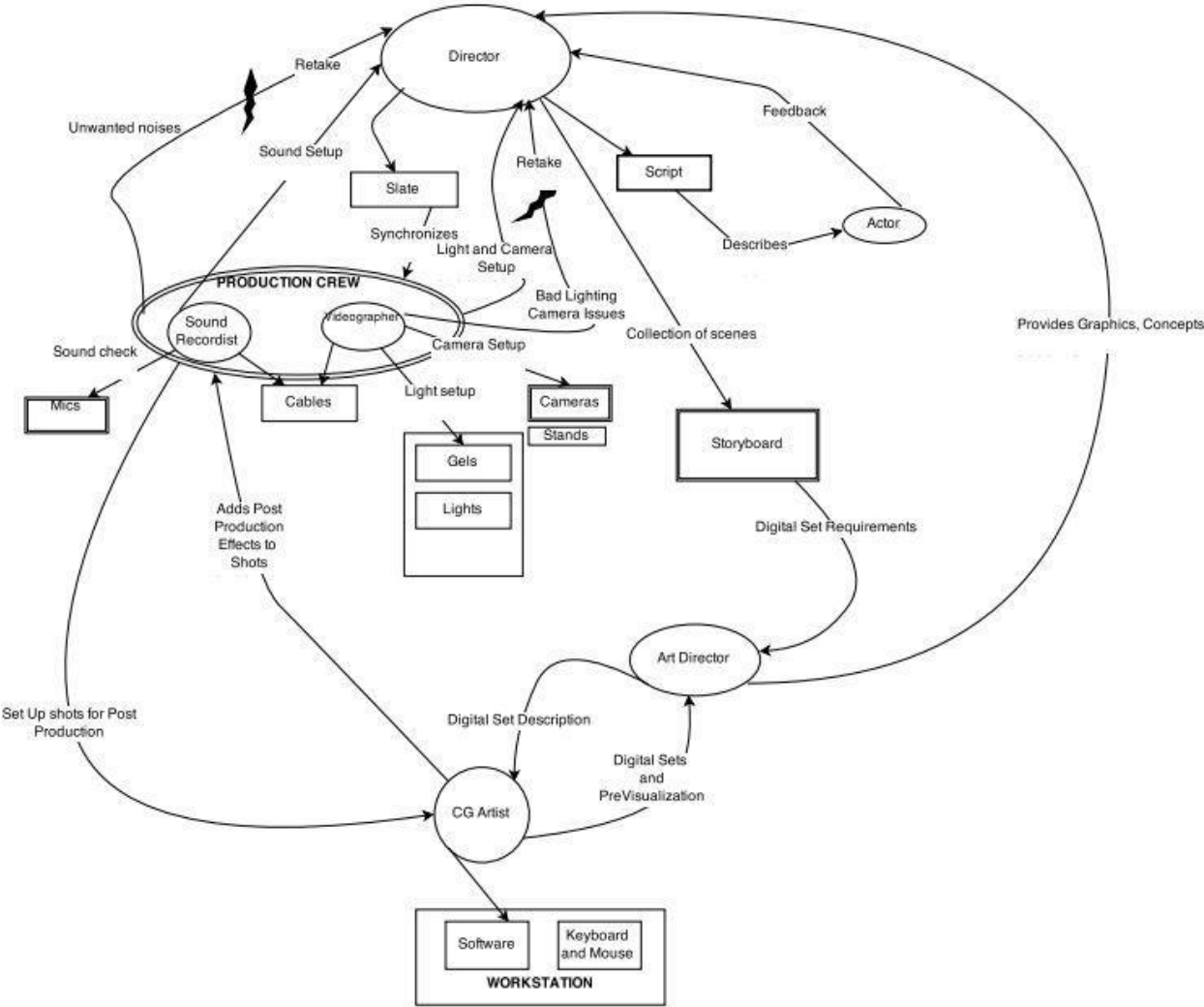
- Providing a repository of standard camera types in which a 'Drone' could mimic, and the extents could be modified by the user
- Having multiple viewports so the user could have a sense of the 'Drone's' positioning in space
- A method to pre-visualize camera movements before initiating them on a moving 'Drone' giving a user the capability to simulate and experiment with shots

D. Consolidated Work Models

Flow Model:

Below is a representation of the coordination, communication, interaction, roles, and responsibilities of the film crew. The inefficiencies uncovered in this flow model mostly have to do with retaking a shot due to lighting, sound and camera issues. The director was responsible for identifying and implementing the re-shoot.

The Art Director is responsible for communicating the requirements of post-production editing, effects and other Computer Generated artifacts to the CG Artist, and relaying the concepts and other graphics back to the Director. Digital Sets require setting up by production crews in a fashion similar to the on-location sets.



Sequence Model:

The step by step process of film production is described below in the sequence model. Intent, triggers, activities and breakdowns are discussed. Most of the breakdowns identified in this model are related to setup inefficiencies related to lighting, audio and camera utilities.

Consolidated Sequence Model

Intent: To unpack setup and organize equipment in a good location for shoot

Trigger: Arrive at shoot.

Activity: Unpack/ Setup stands and cables

Breakdowns: Needed to re-locate in order to find ideal location

Activity: Test audio signal/ volume

Intent: Setup sound and lighting

Trigger: Found good starting location

Breakdowns: -Needed to unplug water cooler (noise distraction)
-Needed to adjust microphone output

Activity: Adjust for ideal lighting

Trigger: Found good starting location

Breakdowns: -Needed to re-position lighting
-Needed to adjust lighting filter

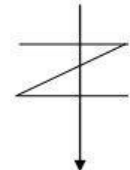
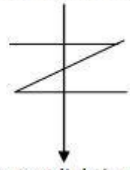
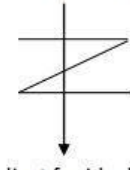
Activity: Re-test lighting with Camera

Intent: Prepare everything for actual filming

Trigger: Lighting and sound setup correctly

Breakdowns: - Power/ Battery issues with camera

Activity: Start filming, repeat for different scenes.



Consolidated Sequence Model (Post-Production)

Intent: Begin post production editing

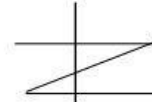
Intent: Add in CG effects

Trigger: Receive post-production guidance from set director along with digital video

Breakdowns: Ask for better footage if scene is shaky or bad quality from original shoot

Activity: Set up scene

Activity: Key-out scene areas for CG effects



Activity: Add in CG effects

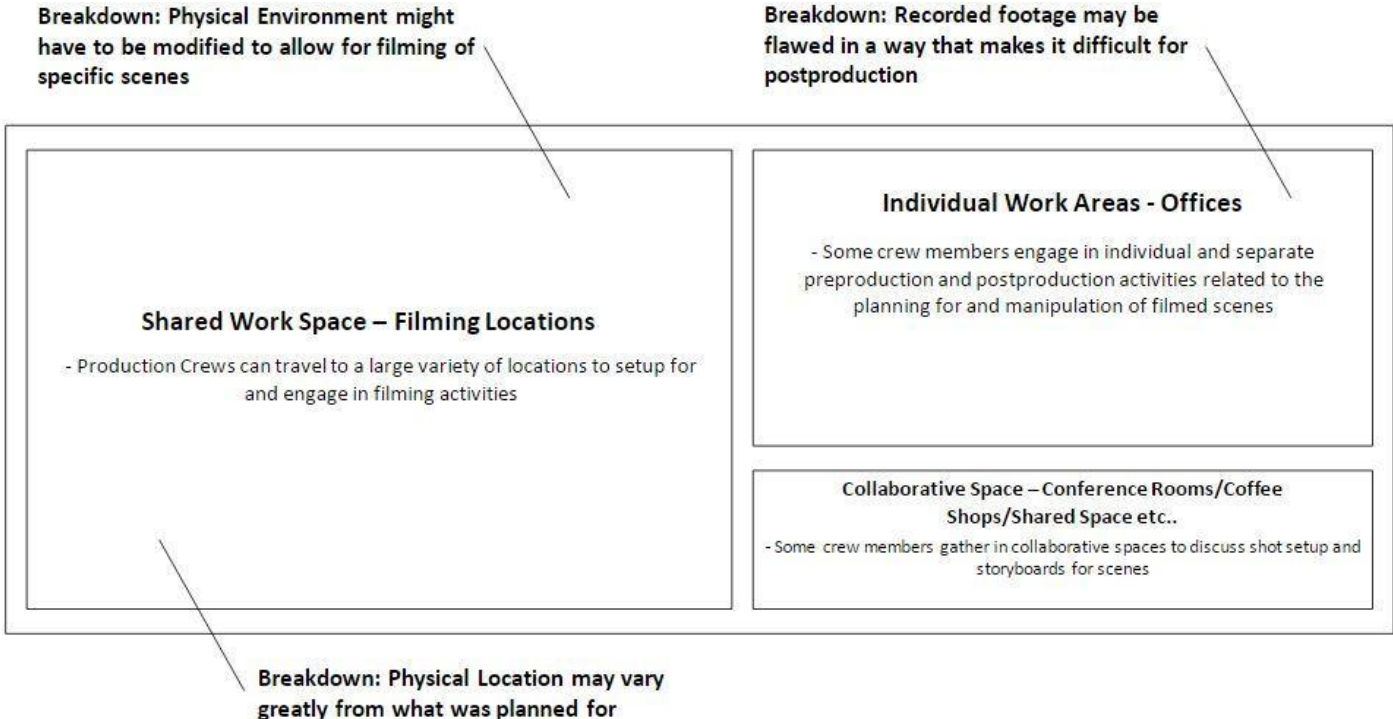
Activity: Receive feedback from producer/ director

Activity: Make revisions or continue

Activity: Render digital effects

Physical Model:

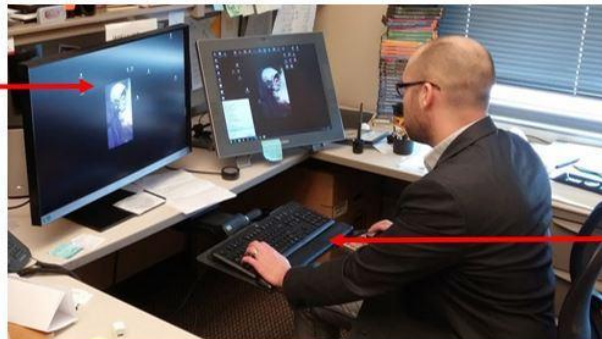
Below is a model that represents the physical environment where the work tasks are accomplished within it. Being that the physical space is ever changing on a film set, most of the breakdowns occur because of different environments and inconsistencies across shoots. This model helped us to identify that these different spaces, across shoots, could lend themselves as an opportunity for an innovative solution.



Artifact Model:

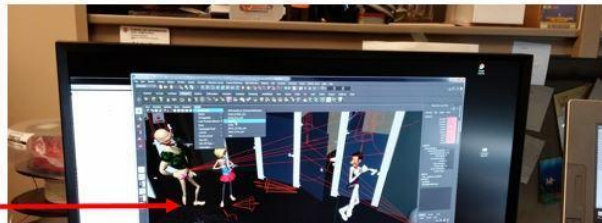
No artifacts were able to be physically collected during our 3 interviews. The artifacts on set were too large and did not have any significance for further evaluation outside of their environments. Some of the artifacts observed in context and on set are listed below. The artifact model gave us some insight on possible inefficiencies with using heavy equipment that requires power outlets and manpower in order to move. This gave us a little insight on how we could use drones in order to make some of these tasks less physically tedious and more efficient.

High Resolution Monitor: used for accurate editing.



Keyboard and Mouse: used to manipulate video editing tools in post production

3D Software: used to edit and supplement video in post production



Stands: used to support lights and camera
Breakdown: Can be bulky



Lighting: used to augment natural light conditions

Camera: used to capture video
Breakdown: Needs to be moved manually

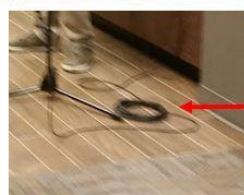
Microphone: used to record audio and test sound levels
Breakdown: Needs to be manually moved from place to place.



Slate: used to sync up sound and video in post production

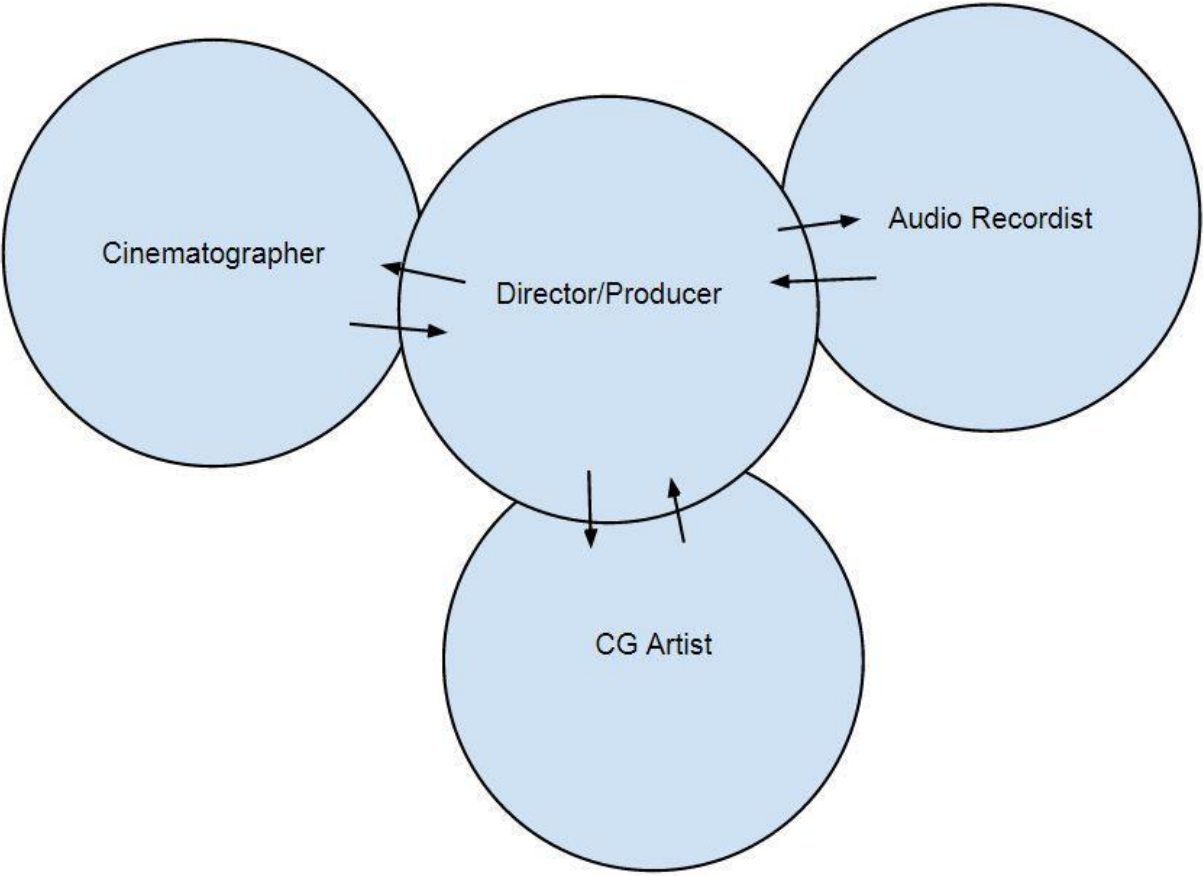


Cables: used to connect and power audio, video and lighting
Breakdown: Need to reach outlets.



Cultural Model:

The interactions and roles that various people play in the role of film production tend to blend into one another. Through observation we noticed that the Director/ Producer, Cinematographer, Audio recordist all took on each other's roles at one point or another during setup and filming. This seemed to be common across different interviews. The CG artist and director closely work together in order to make sure the scenes are correct for editing. The cultural model reflects this close interaction and blending amongst the film crew.



E. Summary of Affinity Diagram

The team gathered all the findings from each of the contextual interviews in order to make better sense of the data. An affinity diagram was created in order to compile all of this data into a logical and more organized fashion.

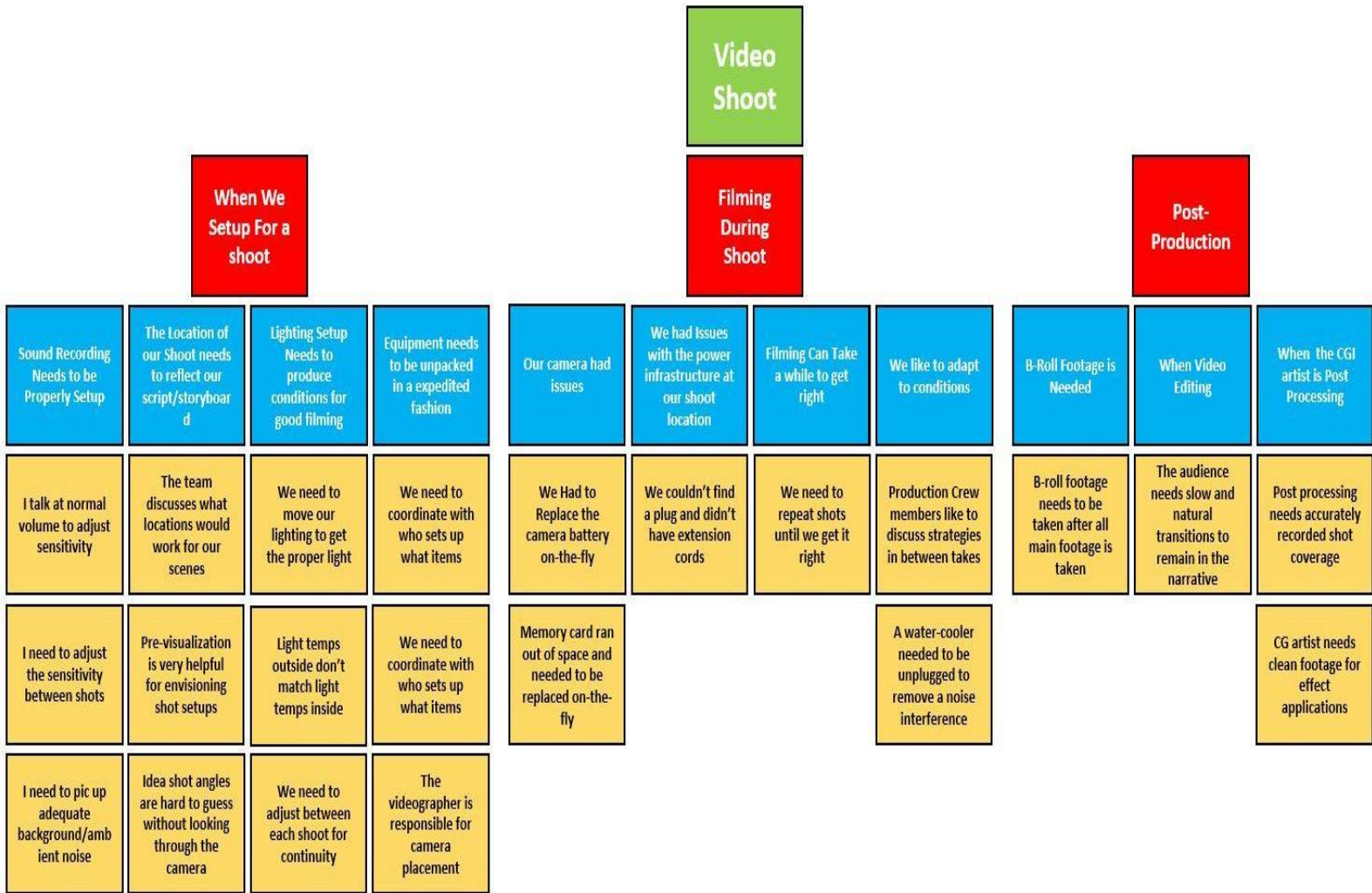
The affinity diagram that was compiled ended up organized into three main sections: setup, during shoot and post production. This organized and compiled information lent itself to a better understanding of the main problem areas throughout the film production process. From these areas, two of those areas lent themselves as more problematic: setup and post production. A formal representation of our affinity diagram is shown at the end of this section.

Emergent Problem Areas

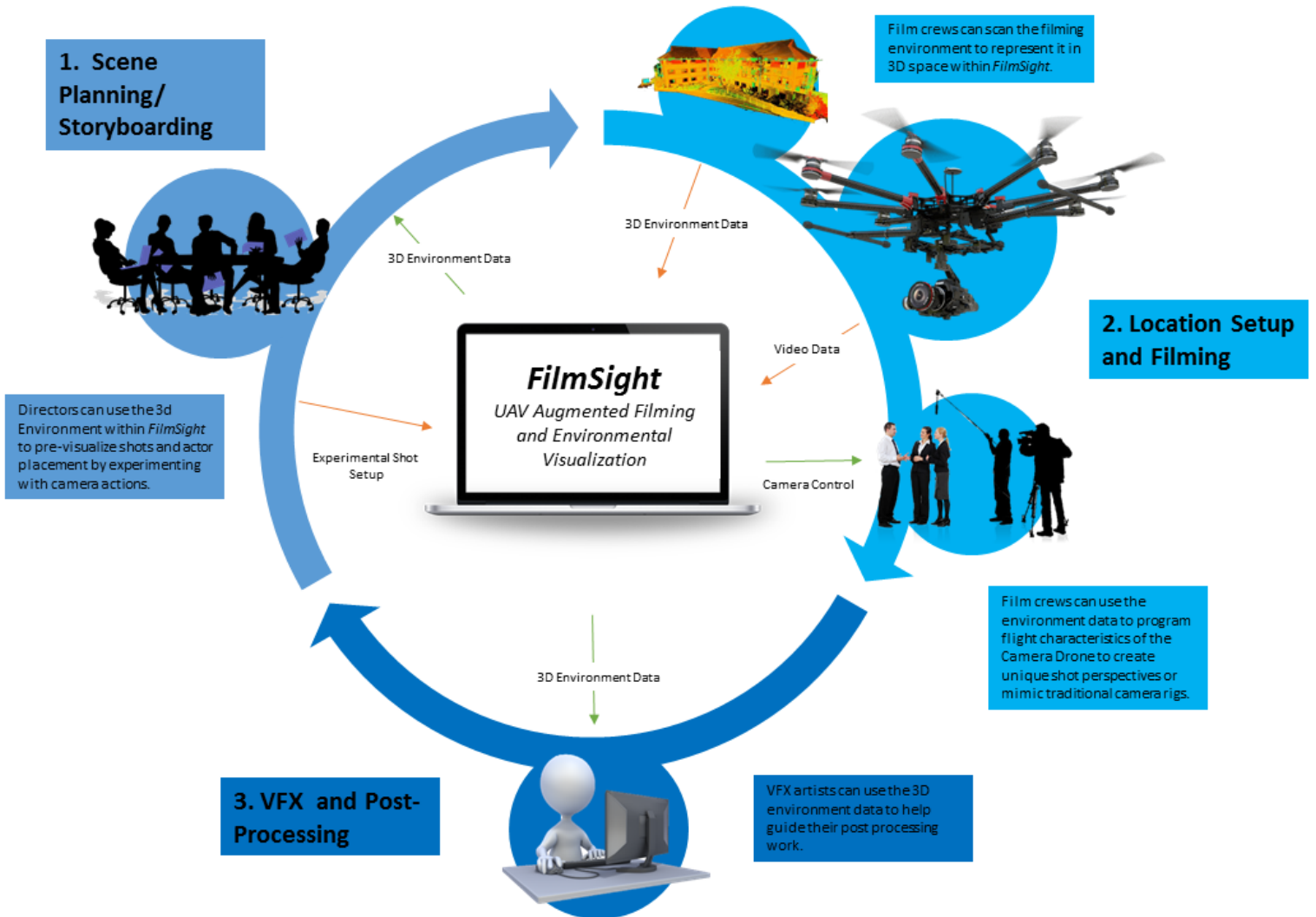
While compiling the affinity diagram some key issues and problems began emerging from the consolidated information:

- *Location of the shoot* - For two of the contextual interviews, it was noted that there was some considerable time coordinating amongst the crew members in order to figure out the best location for the shoot.
- *Setting up sound and lighting* - For interview 1 and 2 there was considerable time in setup for sound and lighting. This setup and time spent was repetitive for most different scenes in interview 1. Sound had to be tested at different levels and adjusted for each take. For interview 2 a water cooler needed to be unplugged due to significant ambient noise. Lighting needed to be moved around the set and adjusted for each shoot. This took a significant amount of time and coordination between the camera and lighting operator. For interview 2, the lighting ended up being bad enough on the recording that a re-shoot was necessary.
- *Power/ Battery Issues* - It was noted that during the film shoot for interview 2 there were a couple of instances where there was either a low battery on the camera or the shoot needed to move closer to a power outlet. Although there are no alternative ways for this equipment to be powered it should be noted that this was an inefficiency during filming.
- *Post-production video editing* - Inefficiencies with post production seemed to be mostly related to the operation of the equipment by the crew during the shoot. Some of the footage regularly needed to be re-shot in order to edit correctly. It was mentioned that during certain scenes that it is very important to have smoothly guided transitions in faster paced scenes in order to not disorient the audience.

Affinity Diagram:



F. Vision



G. Storyboards

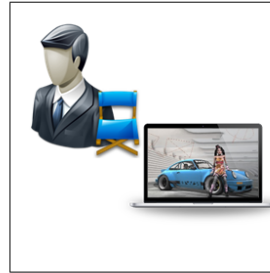
1. Scene Planning/ Storyboarding



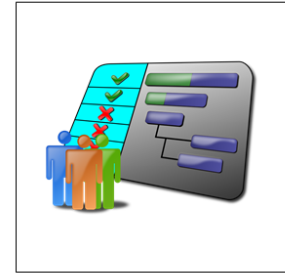
1.1 A film production crew is preparing for a video shoot by discussing upcoming activities and scene direction.



1.2 Earlier, the crew deployed a UAV with a LiDAR scanner to create a virtual 3D environment for the location of the shoot using *FilmSight*.



1.3 The director experiments with different shot perspectives and camera movements



1.4 The crew updates the script and shooting schedule to adjust for the affordances discovered in the filming location.

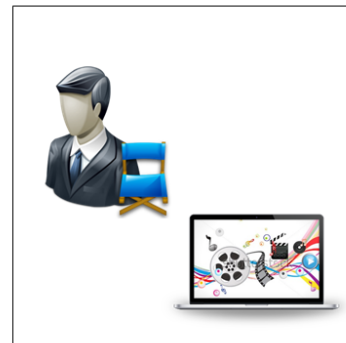
2. Location Setup and Filming



2.1. The production crew uses the shot direction saved into *FilmSight* by the Director to program the flight characteristics of the video UAVs.



2.2. The UAVs are deployed according to their programmed attributes, and are able to fly the same flight path, shot after shot, giving the production crew ample chances to get the scene right without relying on perfection the first time.



2.3 The director reviews the footage from the UAVs and makes changes to their filming characteristics using *FlightSight* to capture different perspectives of the actors in iterative takes.

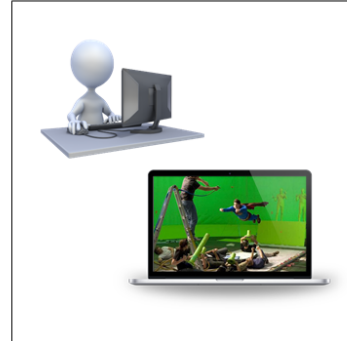
3. VFX and Post-Processing



3.1 The VFX artist is ready to get started on post-production effects work.



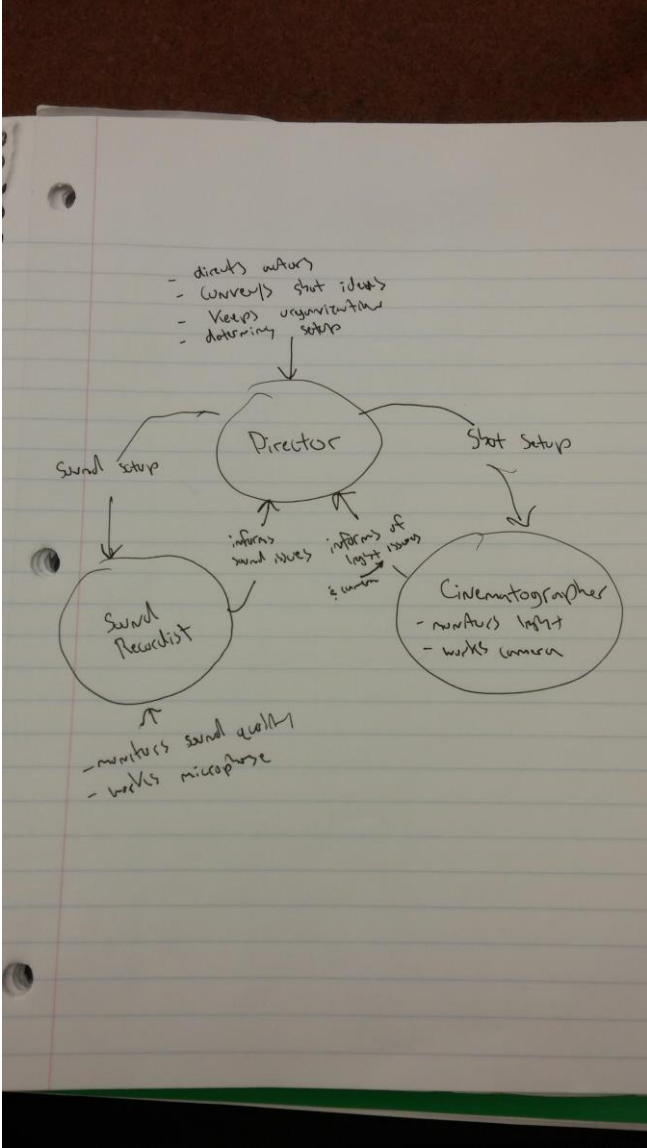
3.2 The receives the scenes requiring post-production work, and matches them up with the 3D environment data provided by *FilmSight*



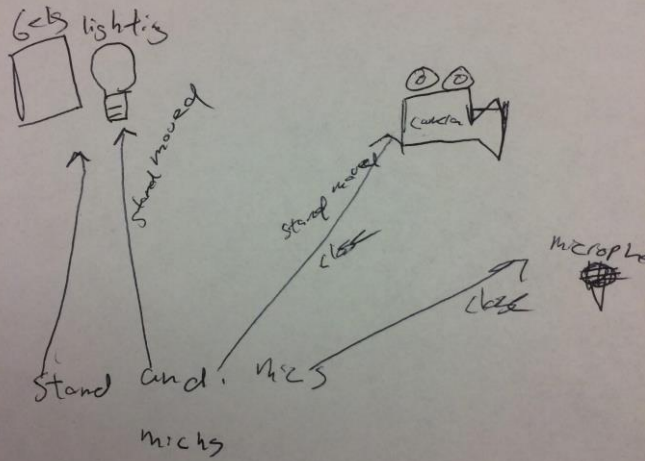
3.3 The Environmental data allows the VFX to do precise motion tracking, using the UAVs telemetry, and the account for physical objects within the scene, but not accounted for in the footage. This allows the VFX artist greater replication of realism and continuity.

H. Appendices

Preliminary Contextual Interview 1 Models and Notes



Interview 1



Interview 1 Sequence

Intent: unpack + organize artifacts trigger: arrive @ shoot

↓
setup scaff and camera

↓
move to shooting area

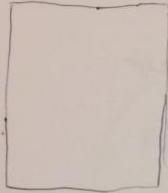
↓
setup lights

↓
done

intent: test lighting

intent: ready for filming

Interview 1
Artifacts
used to manipulate lighting
conditions.

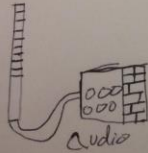


Gels



lights
(lights)

used to assist natural lighting
conditions



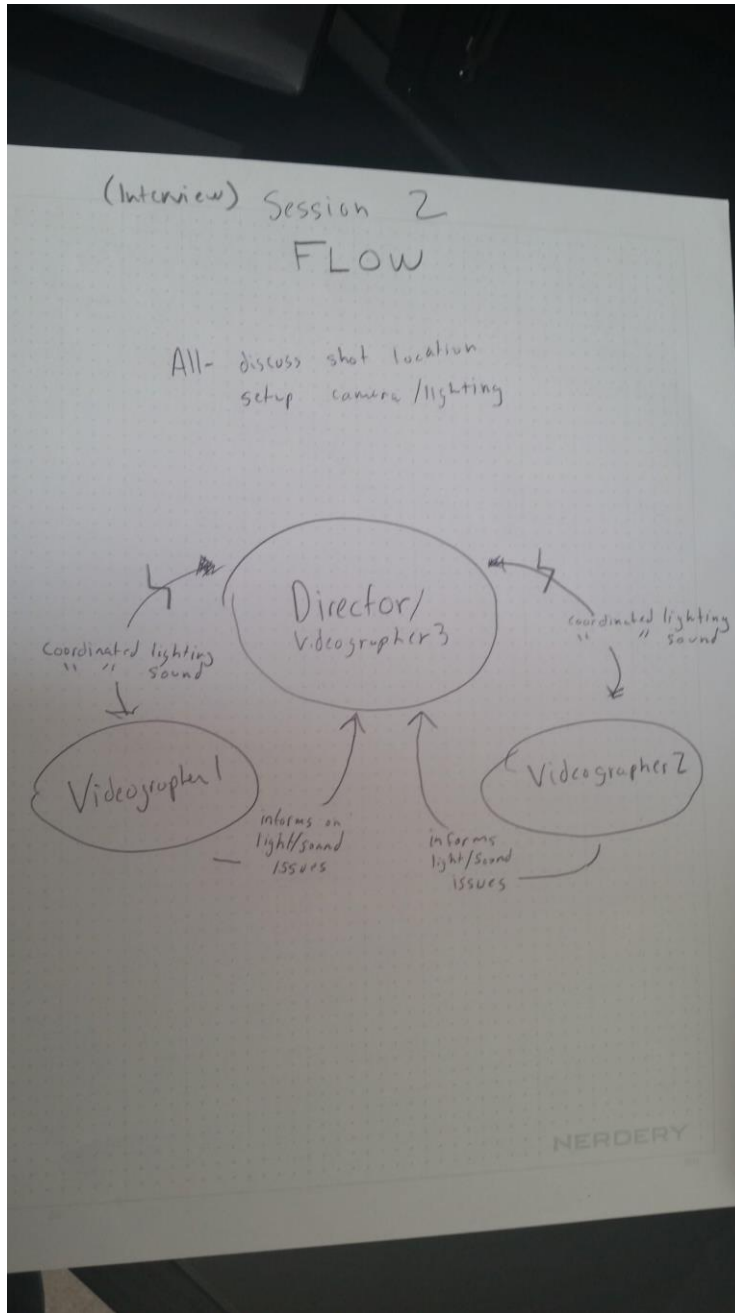
Sound monitored ~~out~~ throughout the
entire process



Slate
(app)

Used to sync up sound and video
in post production

Preliminary Contextual Interview 2 Models and Notes



Interview 2 Sequence

Intent: Unpack + organize artifacts

Trigger: Arrive @ shoot

↓
Setup stands + cables

Intent: Test Sound / Lighting

↓
move to better location

↓
Test audio signal

unplug water cooler

↓
Pick ideal sound location

had to move lights

↓
Pick ideal lighting

Intent: ready for filming

↓
Test camera/lighting

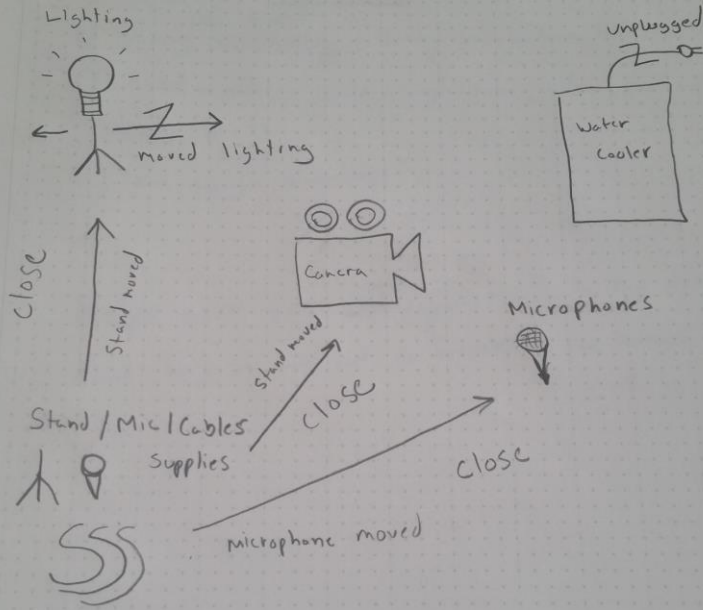
Power Issue

↓
done

NERDERY

Interview 2

Physical



Interview 2
Artifact



- moved for better lighting
(3 times)

Lighting
(Lights)



- checked camera screen for lighting

Camera



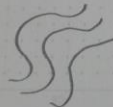
- tested sound
(2 times)

Microphone



- put together + setup stands

Stands

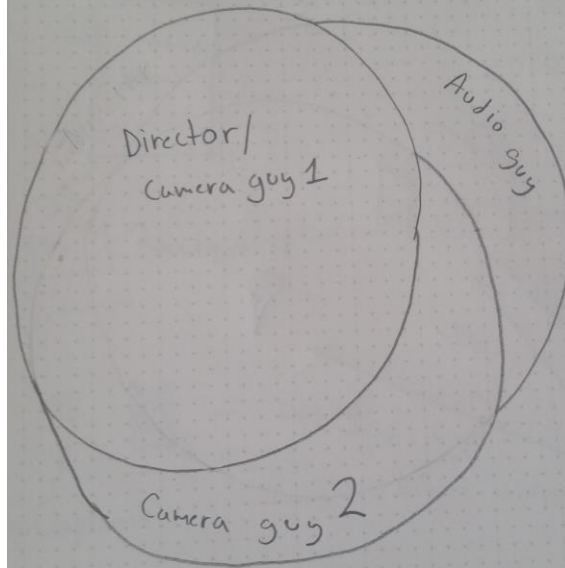


- plugged-in all cables

Cables

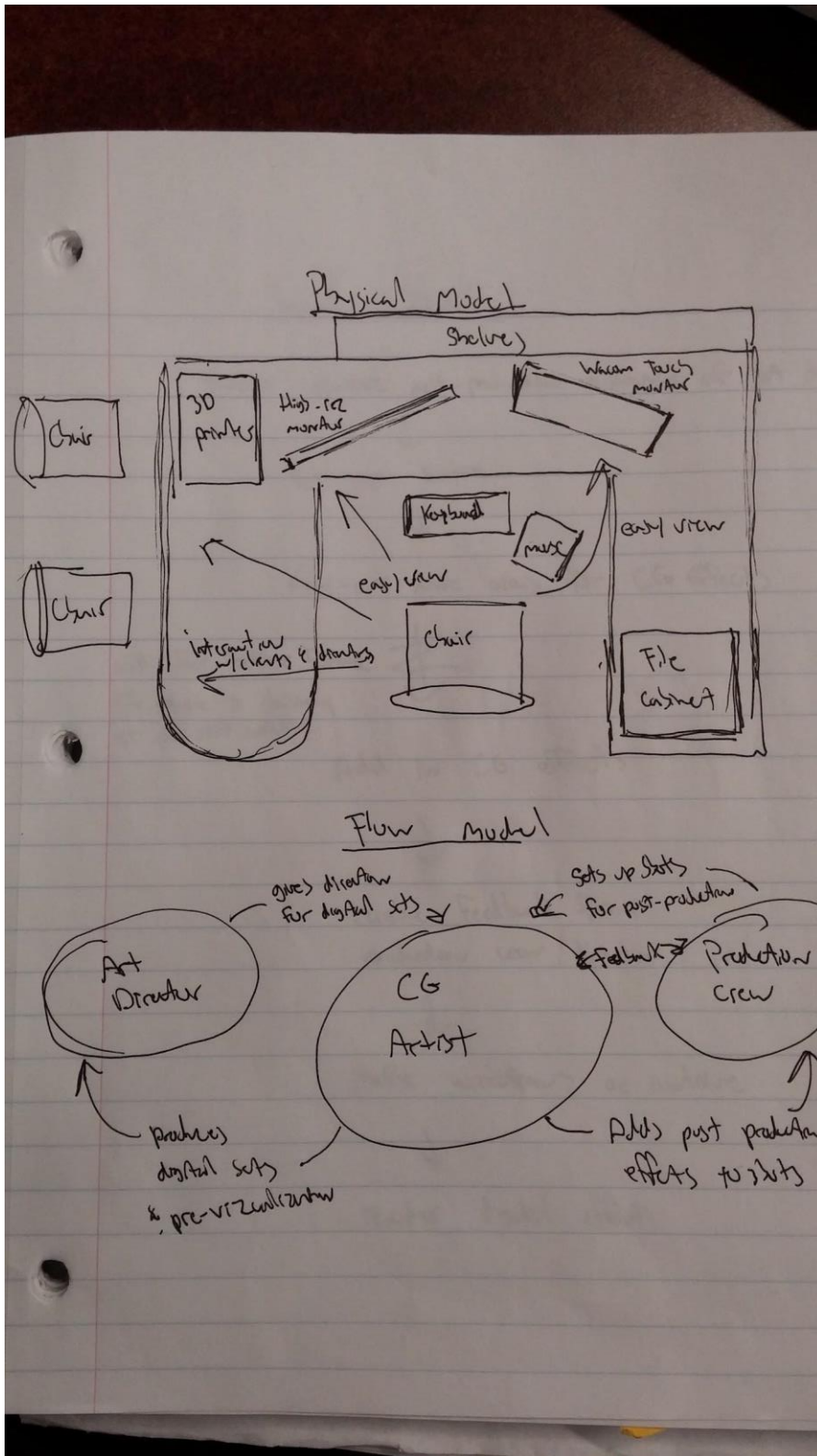
Interview 2

Cultural



NEP

Preliminary Contextual Interview 3 Models and Notes



Sequence Model

trigger: receive post-production guidance of SA director



set up scene



Key-out scene using for CG effects

ask for better footage

if scene is shaky
or not shot correctly



Add in CG effects



receive feedback from
production crew / director



make corrections or continue



render digital effects

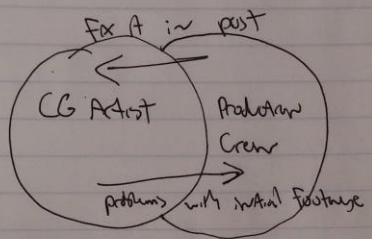
Artifact model

- Keyboard
- Mouse
- High Rez Screen
- Wacom Monitor

Digital Artifacts

- Camera Rig
- Lights
- Scans
- 3D software

Cultural Model



Affinity Diagram Materials

