Concordia
UNIVERSITY

Department of Electrical
And Computer Engineering

Computer Graphics: Real-time Video

Comp 471 --- Fall 2006 --- Section F

Project Scope and Plan Document

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Team members information	
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THE SON OF JITTER (*HTTP://WWW.COMP471.TK*)

Team

Name	ID	Role
Mathieu Paris-Arseneault	4926048	Pattern recognition and website
Cameron Waddell	4462572	Concept lead, overlays and content creation
Nicolas Gauthier	5459788	Installation and logistics
Sivanesvaran Sivakolunthu	4918428	Pattern recognition

All team members share a similar skill set, and therefore all will be involved in Jitter programming, math, and other technical elements of the project. The roles stated above indicate the leader of a particular element of the final project. These individuals will recruit the assistance of other team members as required.

What is the project asking or exploring?

The project draws inspiration the surrealist visual arts movement, particularly from a number of works by René Magritte (1894-1967). In his paining "The son of man", Magritte superimposes the image of an apple over the face of a man wearing a bowler hat. Taken individually, the image of an apple or that of a man holds limited interest. When the two were juxtaposed according to a surrealist aesthetic, the result is both amusing and frustrating, while somehow premeditated.

Figure 1. "The Son of Man", René Magritte, 1964

In the project, we are operating with live and stock videos. These are to be combined as a series of overlays. Scaling and positioning of each overlay is based on information harvested from a live video feed, using pattern recognition tools.

The notion of depth and position guide our aesthetic, as does the use of compelling stock images to augment live video.

When a participant enters the camera's field of vision, they are able to see the image of themselves superimposed against the backdrop chosen for that scene. Examples could

include such locations as a boardwalk with stone fence, a street corner during a riot, the bottom of a fish tank, or in the Whitehouse press-room. A green-screen is used for this effect.

Objects are overlaid either in front or behind of the participants' image. The choice of objects would depend on the aesthetic goal of a particular scene. For instance, apples might block each participant's face in one scene, where stones could fly towards from a target in another.

The key to making this installation interesting lies in having scenes that are compelling and interactive. Scenes will be deliberately designed with custom content that evokes a particular mood. Interactivity depends on pattern recognition and providing targets for each overlay.

Stated differently, we aim to encourage participants with a surreal glimpse at themselves and perhaps a degree of fun.

Pattern recognition looks for a blob that matches a particular pattern, like a face, identifies that blob as an object, and keeps track of its location over time. Areas of pattern can be followed by selecting an area to track, and continuing to search for areas that match the pattern of pixels selected. Shapes to be tracked need to stay somewhat consistent in shape.

The following diagram gives general idea of the pattern recognition patch. The Pattern Recognition patch will be complicated and the details of the patch are unknown at the moment.

Input → | **Pattern Recognition** | → | Output (x,y,z) |

Figure 2: Pattern Recognition Patch

MATHEMATICS

Overlays are positioned according to a Cartesian coordinate system. The x and y coordinates correspond to placement on a two dimensional screen. The z direction is simulated through resizing each overlay (zoom). For some motion applications, spherical coordinates (ρ, ϕ, θ) are more convenient, and can be readily converted into rectangular coordinates (x, y, z).

Each overlay has the following characteristics:

- Position (x, y)
- Zoom (z)
- Offset (x, y, z)

Overlays are placed in either of two modes – "over" and "under". Over will place the overlay in front of the participants. Under will place the overlay behind them. Since participants play in front of a green-screen, the compositing should be achievable in real time. Modes can change for each overlay throughout a scene.

The pattern recognition (PR) patch provides targets (x, y, z) to the overlay patch. Each target is continuously updated. The PR patch bases its choice of targets on an analysis of patterns. It draws from the video stream immediately post chromakeying. This provides a degree of independence for the two programming efforts (overlays, PR patch).

The overlay patch places an image upon each target (x, y, z). The images are centred over the target, unless an offset (x, y, z) is used. Offsets are used for exploring additional effects, such as having an image rotate around a moving target.
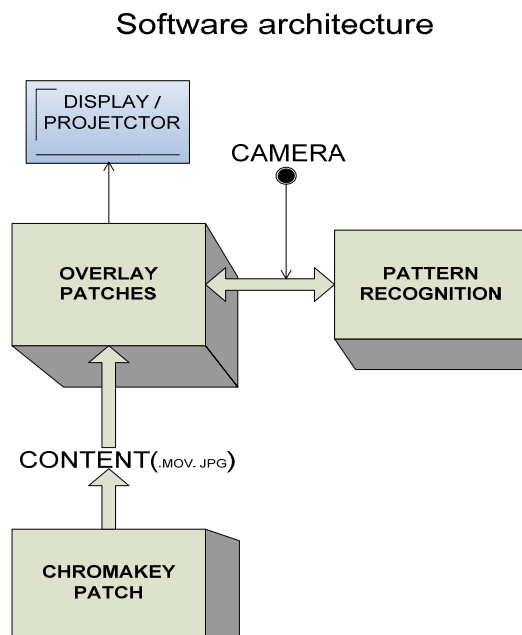
Software Architecture

Software architecture

DISPLAY / PROJETCTOR

CAMERA

OVERLAY PATCHES

PATTERN RECOGNITION

CONTENT(.MOV. JPG)

CHROMAKEY PATCH

Figure 3: Software Architecture

Installation Design

We have selected a location in EV Building lobby underneath the stairs that lead to the 2nd floor. This location was a strategic choice, since it allows us to hang the projector and position the Main Screen and the Green Screen accross from each other.

The projector hangs beneath the stairs on a small, purpose build platform. The handrail uprights provide perfect anchor points for the rope. By adjusting the lengths of the 4 supporting ropes, we can very accuratly aim the projector. The cable will be run under the stairs to the laptop.

The laptop will lie near to the column in the middle of the landing of the stairs. This will keep it out of the way and provide a centralized location to run all cables too. Power is only available along the far wall, so we will use a long extension cord that will be duct taped to the ground to prevent safety issues.

We will be projecting onto the wall, however, we will also be taping a flat white sheet onto the wall in order to improve contrast and make a uniform screen. The screen will start a few feet off the ground, allowing us to place the iSight camera on small tripod directly underneath it. This hopefully will allow the camera to get a straight on shot of the subjects in front of the green screen while at the same time prevent the projector from blinding the camera.

Directly oposite from the projection screen and at the back edge of the stairs will be the green screen. The screen will be constructed using green material (sheet or plastic) and 2 wooden uprights. The green screen will extend from the floor to the bottom edge of the stairs.

Not pictured in any of the diagrams is the fact that there will be curtains behind the green screen. These curtains should be easy to set up by hanging them off of the edge of the stairs. They will provide a more sheltered environment in which to record. By blocking some of the interference light, the pattern recognition patch should work much better.

Trafic will be coming from either side. Subjects will hopefully stop and look at the screen as they walk by, and interact with the camera and the overlay objects. By blocking 2 sides, we ensure that trafic will only be moving in one axes. Most trafic will be coming from the front of the building towards the Metro side.
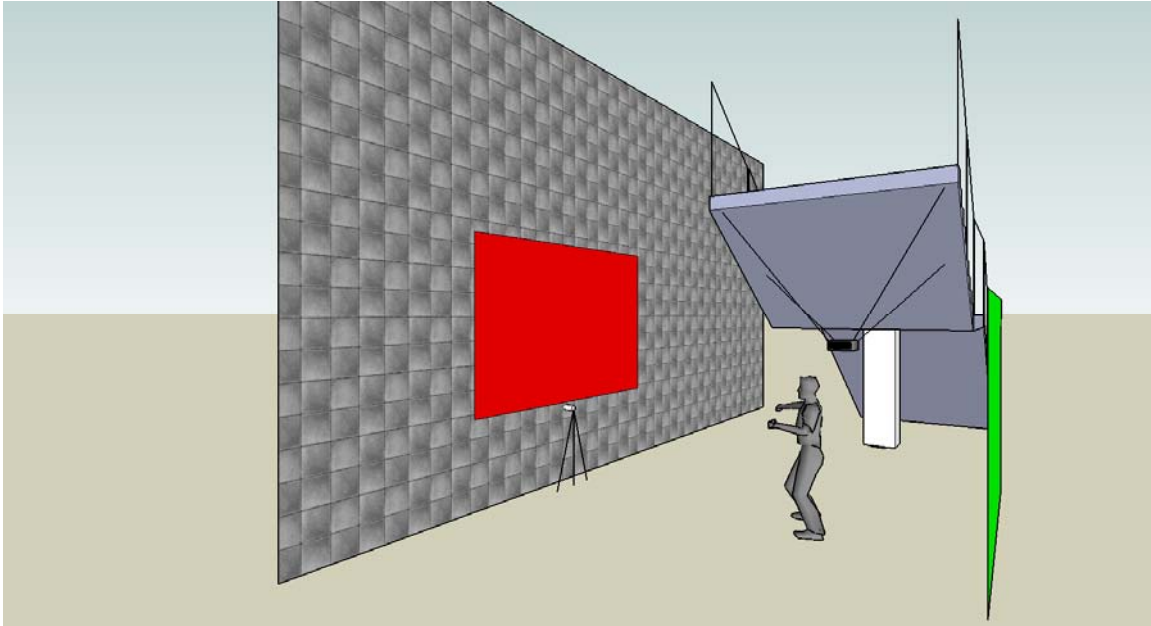

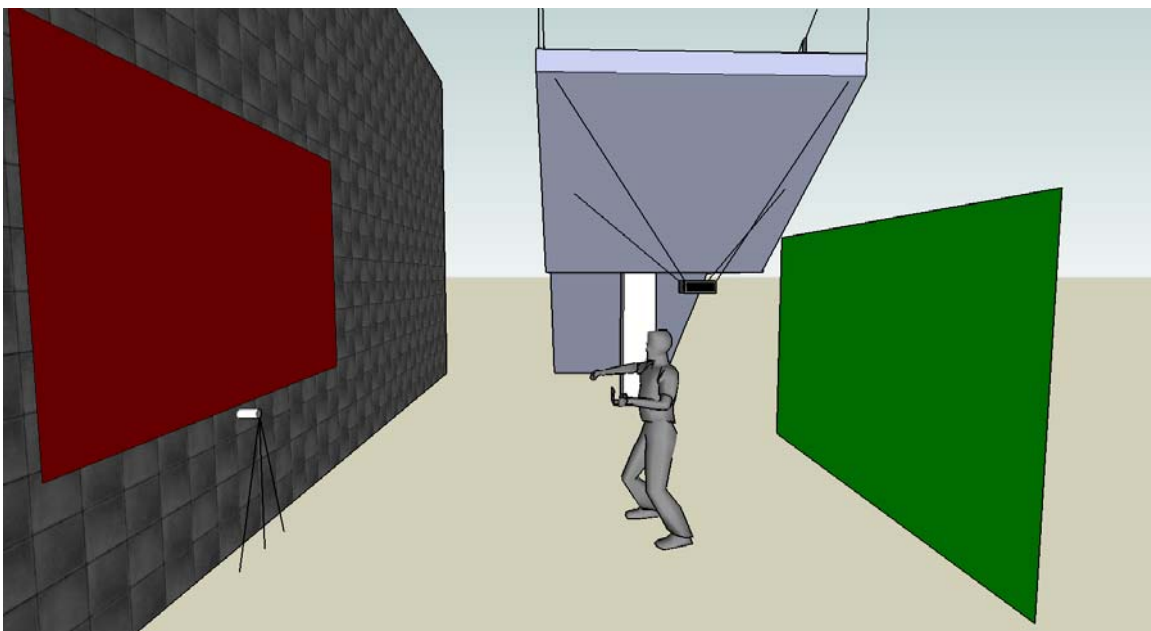Figure 4. 3D Diagram showing projection screen, camera, and projector.

Figure 4. 3D Diagram clearly showing the subject underneeth the projector and inbetween the 2 screens.
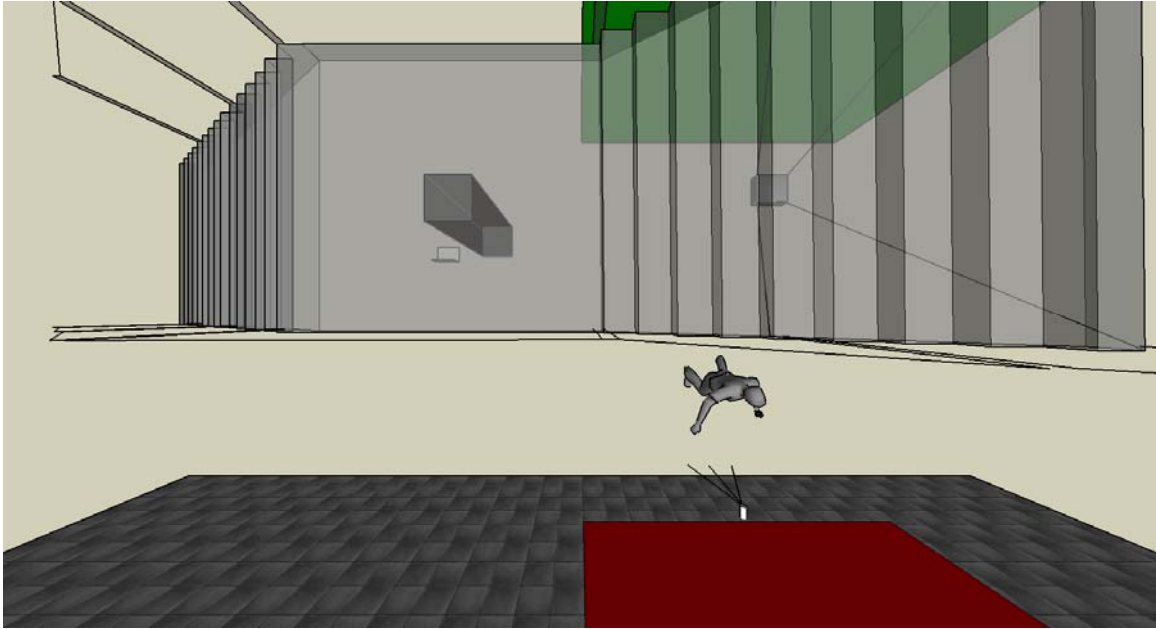
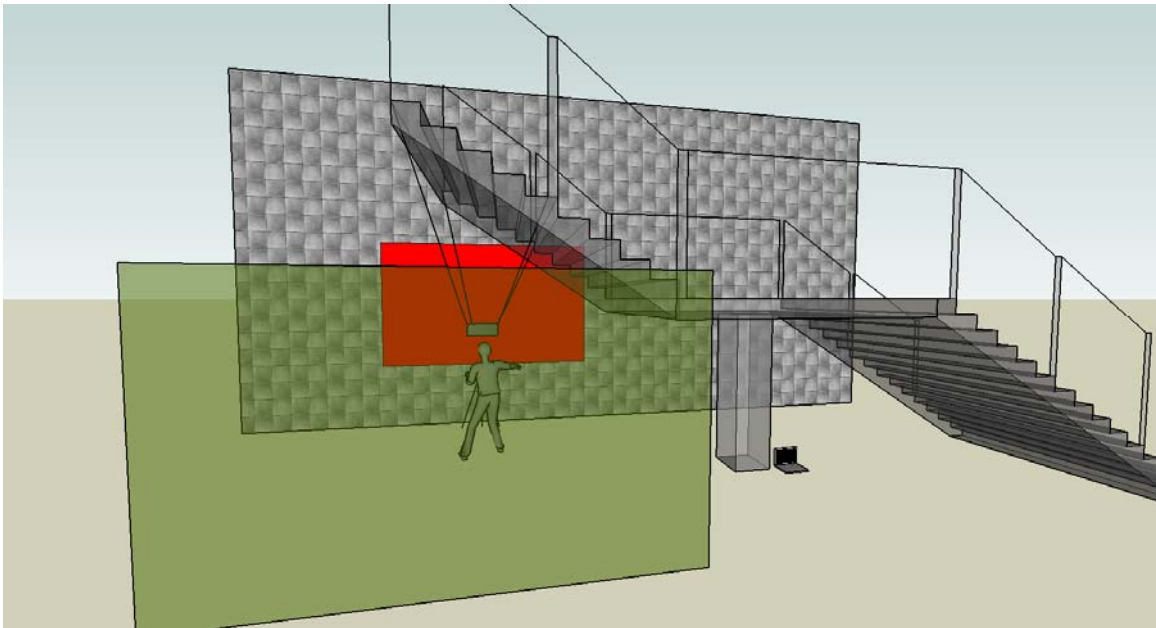Figure 5. 3D Top View showing subject, Projector, Screen and Green Screen

Figure 6. 3D View behind the green screen showing subject in relation to stairs

Milestones / Timetable

As shown in Table 1, each team member has been assigned multiples tasks to do for the project. Additionally, we can see the duration and finish time of each task. While this timetable may vary a little during semester all tasks must be completed to make sure we get a successful project.

Table 1 Timetable of Tasks Required

ID	Task Name	Start	Finish	Duration	Oct 2006			Nov 2006			Resource Names
					10/22	10/29	11/5	11/12	11/19	11/26	
1	Write Deliverable #1	10/20/2006	10/23/2006	2d							Everybody
2	Create Slides For Proposal	10/20/2006	10/23/2006	2d							Nick
3	Create & Update a Webpage	10/20/2006	11/30/2006	30d							Mathieu
4	Design Architecture	10/20/2006	10/24/2006	3d							Everybody
5	Pattern Recognition Patch	10/20/2006	11/16/2006	20d							Siva, Mathieu
6	Overlays & Content Creation Patch	10/20/2006	11/9/2006	15d							Cameron
7	Merging Pattern & Overlays Patch	10/20/2006	11/30/2006	30d							Everybody
8	Installation & Logistics	10/20/2006	11/2/2006	10d							Nick
9	Write Final Deliverable	11/27/2006	11/27/2006	1d							Everybody
10	Create Slides For Final Deliverable	11/27/2006	11/27/2006	1d							Siva
11	Presentation Preparation	11/27/2006	11/27/2006	1d							Everybody

Example Video

A sample video is provided (COMP471_sample1.mov). As we are still in the exploratory stages, this video presents a conceptual glimpse of our aims. Further refinement is clearly required. For instance, the chromakeying was performed against a white background, which is not ideal. Constructing a green screen will be central to achieving the final aesthetic of the installation.

Deliverable

- Pattern recognition patch
- Overlays patch
- Library of content (Jpg, Mov)
- Physical Installation

Final project will be burn on a CD and will be presented in the EV building.

Resources needed

1. Mac Laptop
2. Projector
3. iSight Camera
4. Tripod
5. Green Screen
6. White Screen to project on
7. Rope and platform
8. Extension Cords
9. Long FireWire and VGA Cables
10. Curtains
11. Duct or Gaffers Tape

References

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