X – FADE: Flight Simulator Chair

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Background

Due to high operational costs of real airplanes, flight simulators have gained popularity for pilot trainees as well as average enthusiasts. Most existing flight simulators have two or three degrees of freedom of motion and use a combination of computer monitors to display graphics in front of the user. Our flight simulator takes the experience to another level, providing the user with a more realistic and immersive experience of what it feels like to fly a plane through the use of virtual reality goggles.

Project Goal

Our goal is to accurately simulate the flying experience by using virtual reality goggles and a dynamic control law that regulates air flow to two pneumatic pistons - one for pitch and one for roll motion to mimic the acceleration forces felt in an airplane. We will also integrate rudder pedals, a weight sensor in the seat, and user-defined gain in order to adjust the response of the system based on the user's preferences.

Objectives

- Integrate Oculus Rift headset and infrared camera
- Improve response-time of system with improved control law
- Make user-friendly
  - Simple startup/shutdown procedure
  - Ease of manipulating gain

The DCS World simulator allows the user to look around inside the cockpit
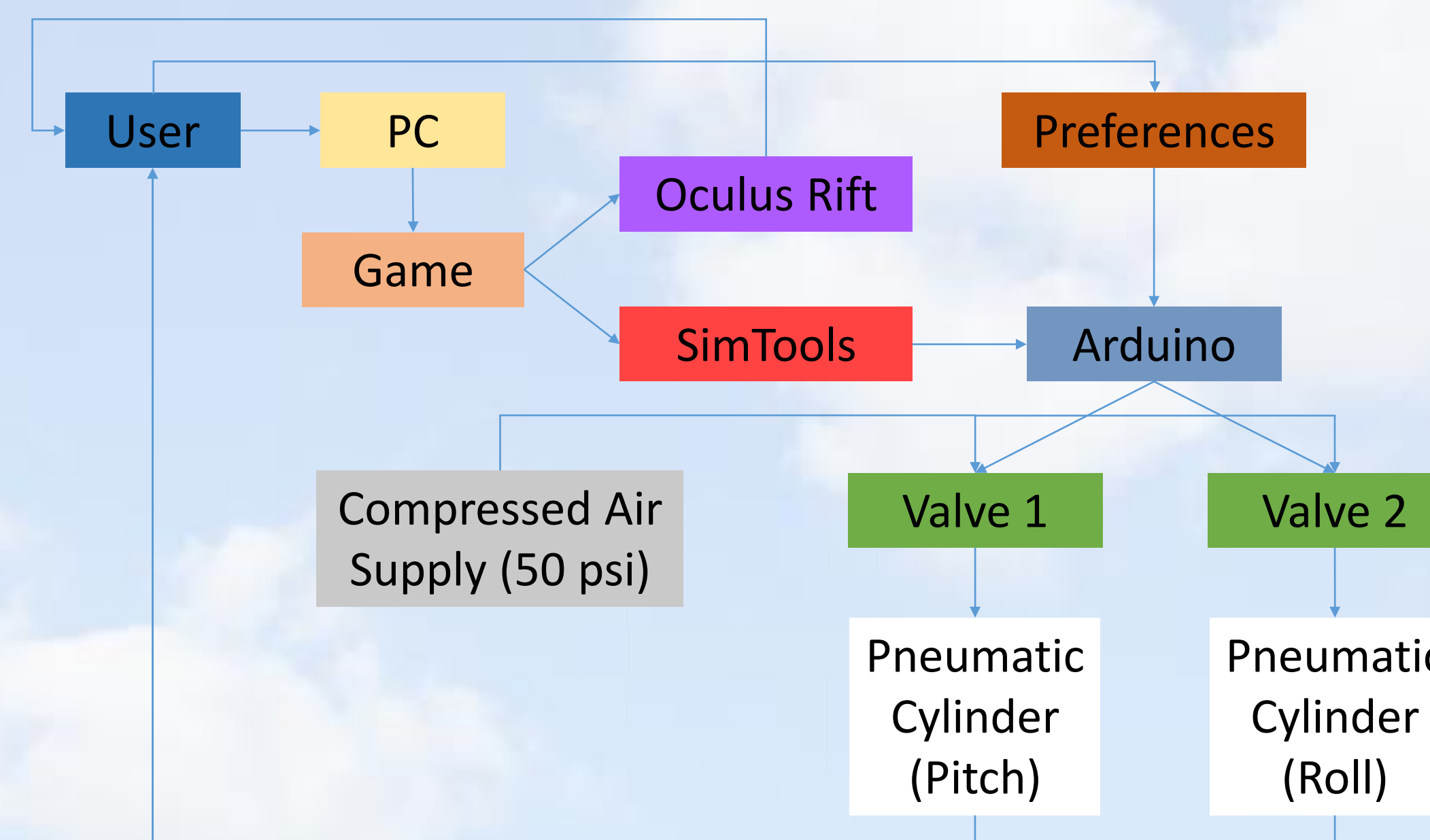

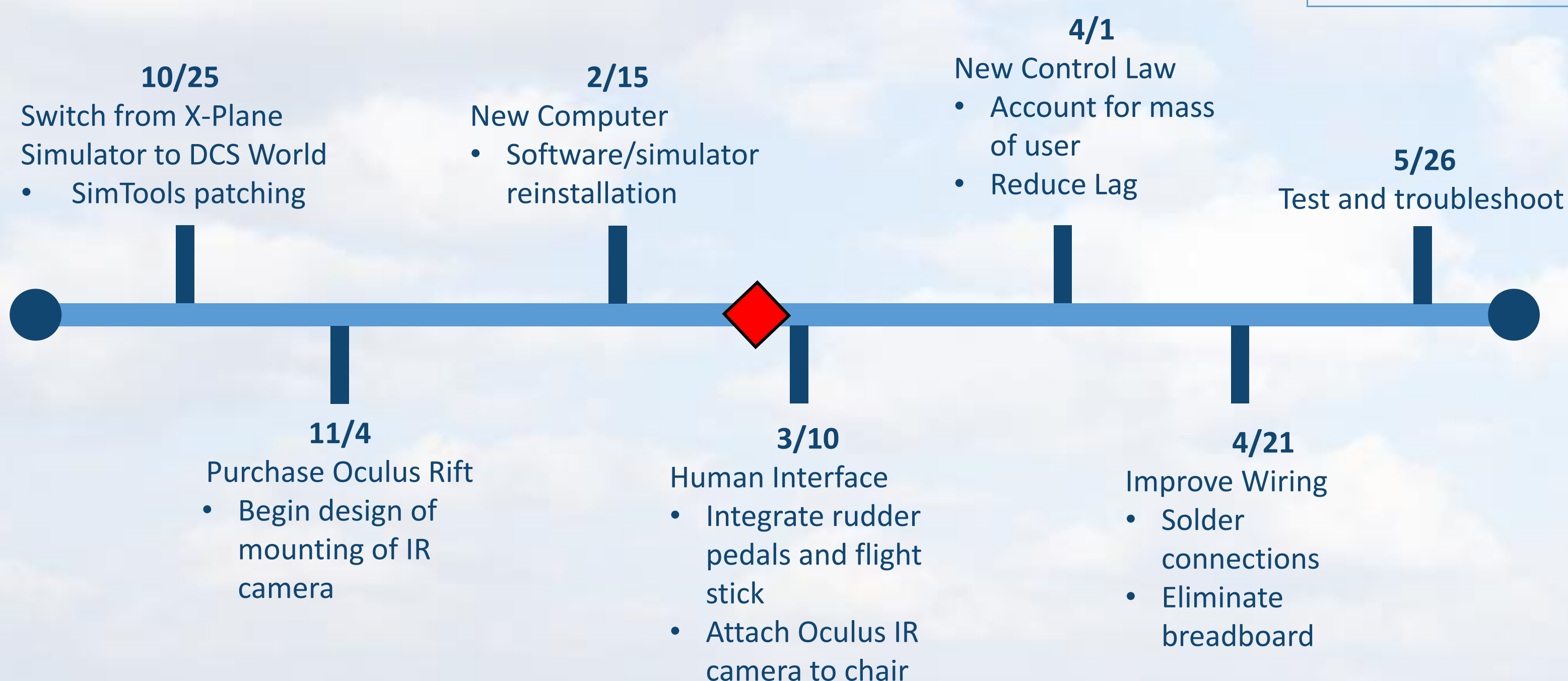Oculus Rift provides a very realistic visual and auditory simulation

The flight stick and throttle lever will be mounted to the chair in front of the user
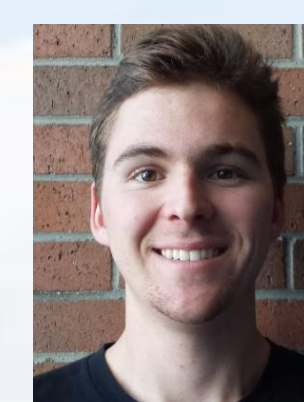
Controls

User → PC → Game → Oculus Rift / SimTools → Arduino → Preferences
Arduino → Compressed Air Supply (50 psi), Valve 1, Valve 2
Valve 1 → Pneumatic Cylinder (Pitch)
Valve 2 → Pneumatic Cylinder (Roll)

Project Timeline

10/25
Switch from X-Plane Simulator to DCS World
- SimTools patching

11/4
Purchase Oculus Rift
- Begin design of mounting of IR camera

2/15
New Computer
- Software/simulator reinstallation

3/10
Human Interface
- Integrate rudder pedals and flight stick
- Attach Oculus IR camera to chair

4/1
New Control Law
- Account for mass of user
- Reduce Lag

4/21
Improve Wiring
- Solder connections
- Eliminate breadboard

5/26
Test and troubleshoot

Team Structure

McHenry Carlson
Team Manager

Matthew Gutierrez
Safety Officer

Ethan Peng
Documentation Manager

ESTIMATED BUDGET: $2000

- Computer $1000
- VR Integration $660
- Human Interface $260
- Plumbing $40
- Controls $40

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