Mission Control: A Science App for the Lewisburg Children's Museum

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Background/Motivation

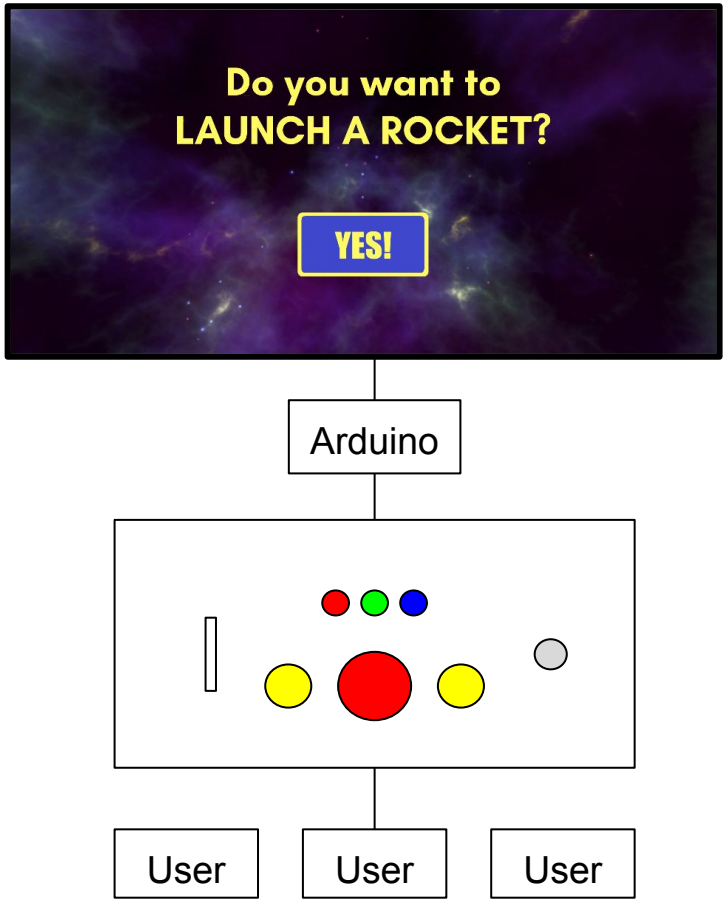
- Tasked with creating an interactive game for the Lewisburg Children's Museum's space exhibit

- Two key goals:
  - To create an interactive environment in which children can learn about the fundamental concepts of projectile dynamics
  - To make this project easily modifiable and accessible for future work

- Leverage "learning by curiosity" with an emphasis on intuitive design

Design - At a Glance

- The game is played by one user at a time interacting with the controller.
  - Other children can watch, which creates a fun, cooperative learning environment.
  - Game provides a variety of missions.
- The controller is powered by an Arduino, which sends the signals from the controller to the machine.
  - Signals come from six buttons and two potentiometers.
- The computer runs the game on the Unity game.



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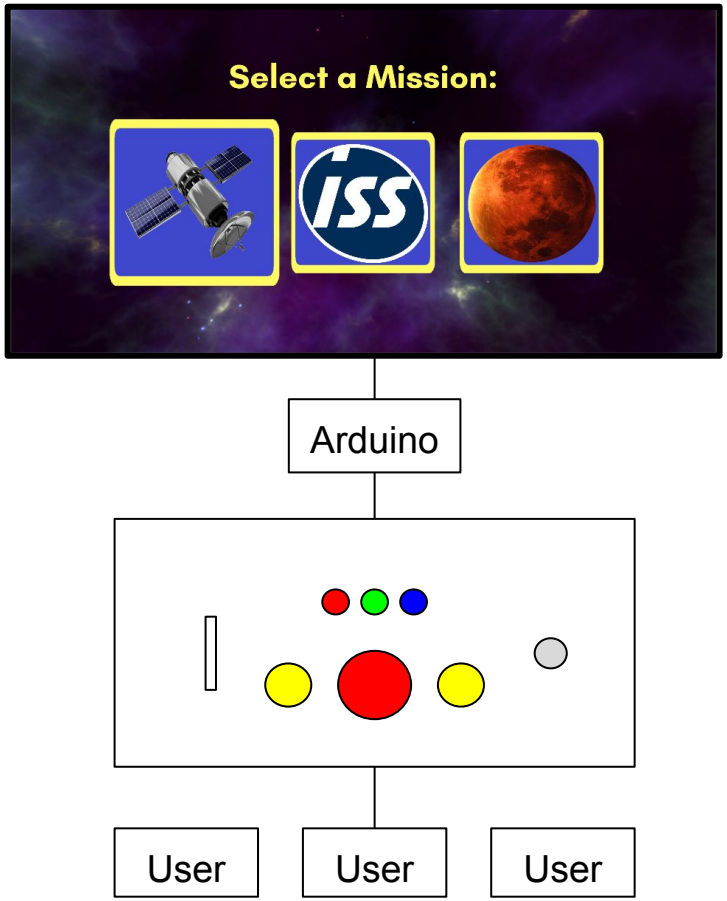

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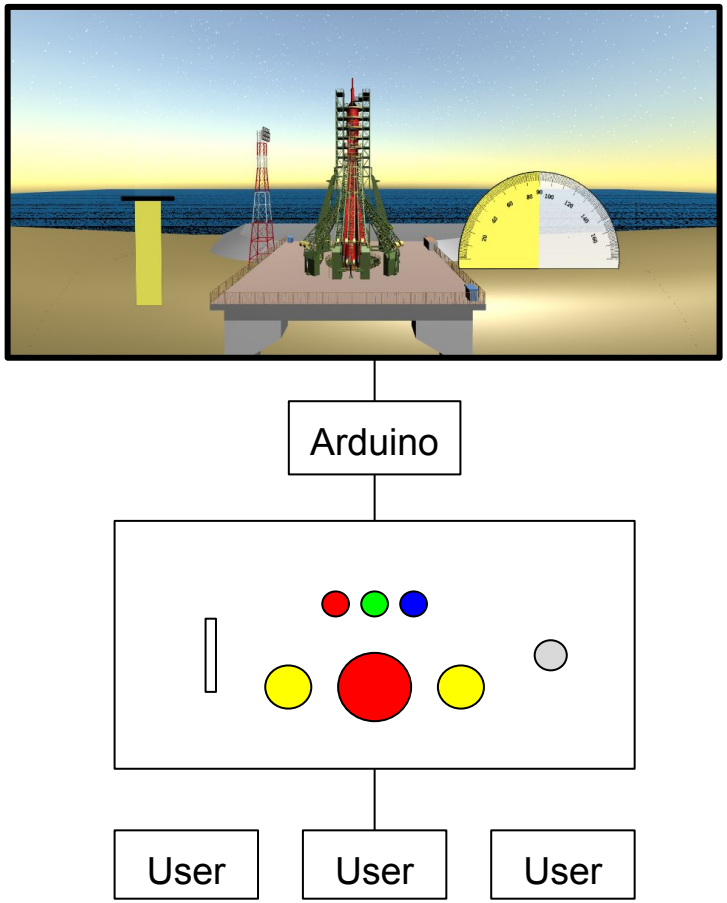
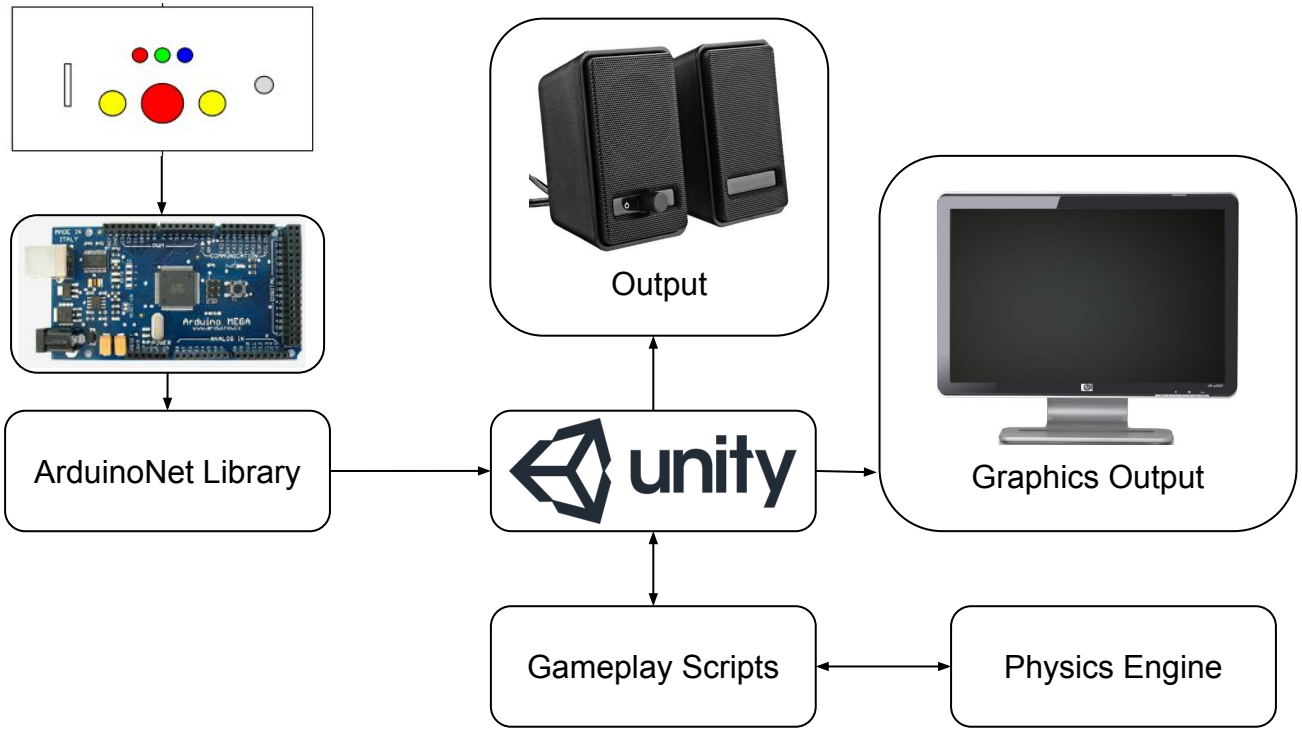


Design - A Closer Look

- Physical Inputs
- Arduino
- ArduinoNet Library
- Unity Game Engine
- Gameplay Logic
- Physics Engine
- Audio Output
- Graphics Output

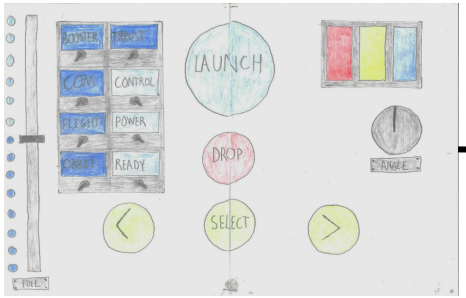


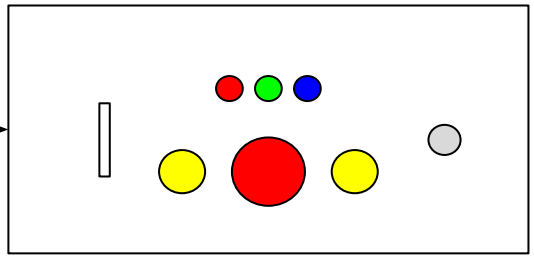
Implementation - Unity

- Unity provides a great environment for building highly customizable 3D games.
- Massive community support was a big draw.
- Cross-platform development support ensured that our project can run on any architecture.

Implementation - Analog Controller

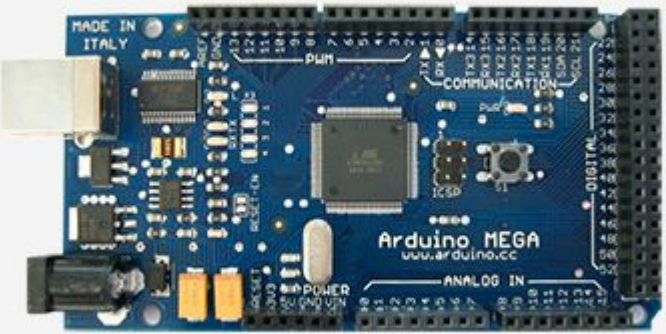
- The controller is made of hardware components from a variety of online outlets.
- Our design went through several iterations before completion.
- User testing insured a completely intuitive design for the kids.





Implementation - Arduino

- The controller is powered by an Arduino.
- The Arduino interfaces with the computer via a simple USB connection.
- Through the ArduinoNet library, the signals sent from the microcontroller are processed into signals Unity can understand.

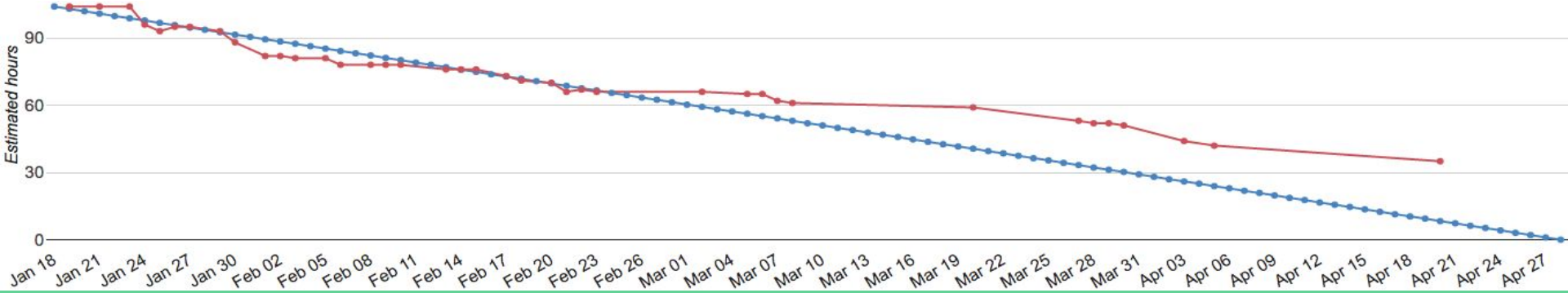


DEMONSTRATION

Development

- Our SCRUM experience

- Timeline of development:
  - Exploring design options: iPad, Raspberry Pi, **Computer and Arduino**
  - Learning the Unity game engine
  - Developing features of the game: Rocket Mechanics (Michael), UI (Kenny), Hardware (Keyi)
  - Integrating all of the separate parts
  - Finalizing the project: buying materials and constructing the final product



Final Remarks/ Reflections

- Things we learned:
  - How to capitalize on each team member's strengths
  - Learning a new development tool

- Challenges:
  - Small team size
  - Unity's steep learning curve.
  - Adhering to SCRUM with Yodiz

- Future work:
  - Fuel Pod Dropping
  - Mission Feedback
  - Fun Hardware Components

Acknowledgments

- Lewisburg Children's Museum, for providing this opportunity
- Our client, Professor Erin Jablonski
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- Matt Lamparter and Eric Chesek, for hardware assistance
- lynda.com and unity3d.com, for extremely helpful tutorials