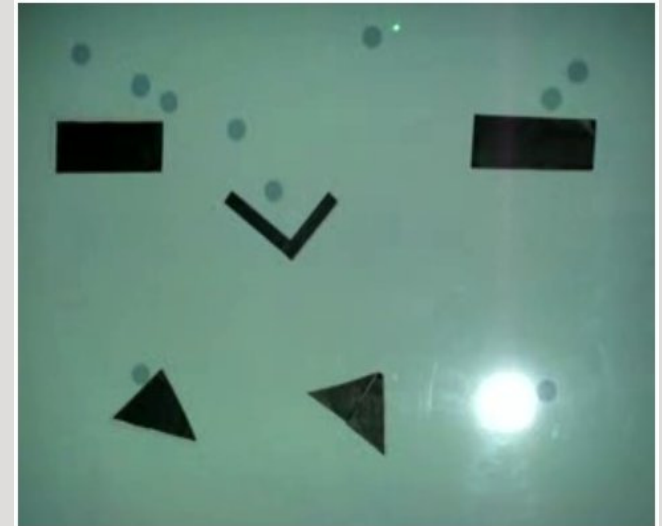# Shale:
SHAdows LEvers & Wheels

Paul Gerhardt
Amanda Orin
Tomas Ramirez
Jessa Rothenberg
Kaiti Trimble

Presentation Overview

- Sponsor & Background
- Problem
- Solution
  - Conceptual Overview
- Requirements
  - Functional Requirements
    - User Interfaces
  - Environmental Requirements
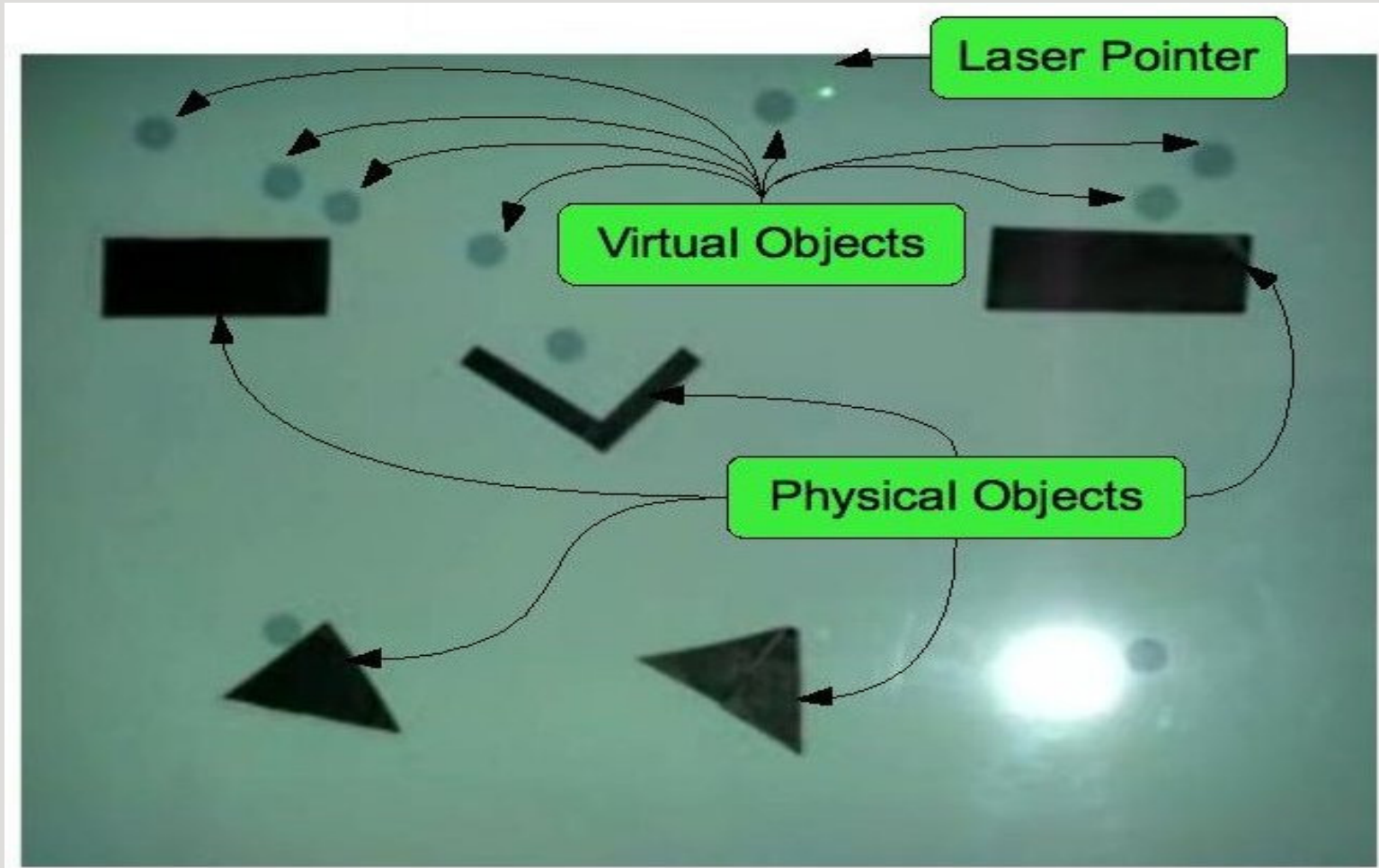- Architecture Overview
- Software Demo
- Summary of Points

Sponsor & Background

- Sponsored by Craft Technology Lab
  - Subsidiary of the L3D
  - Craft objects with embedded intelligence
- Derived from LaserBall Project
  - Joins physical & virtual objects
  - Non-mechanical interaction
 - Limited performance

LaserBall

Problem

- Interactions between virtual and physical objects, controlled to some degree by a user.
  - Expand LaserBall idea
  - Incorporate reactive physical objects
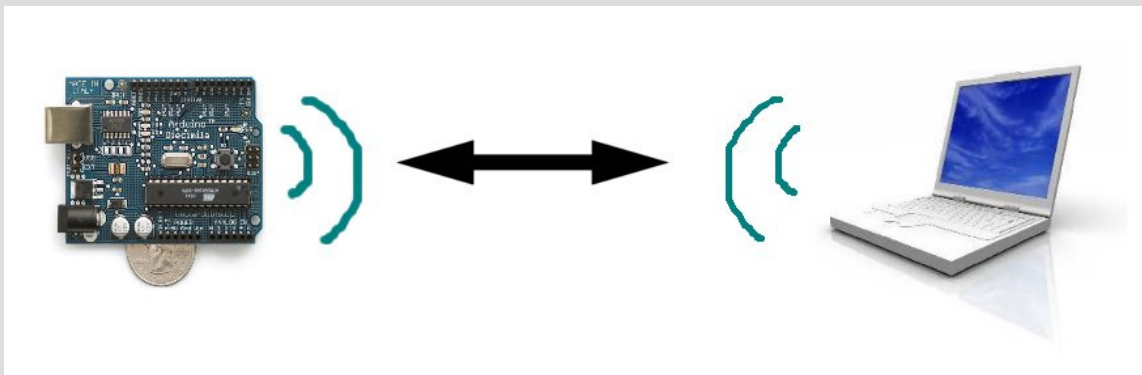 - Wireless communication

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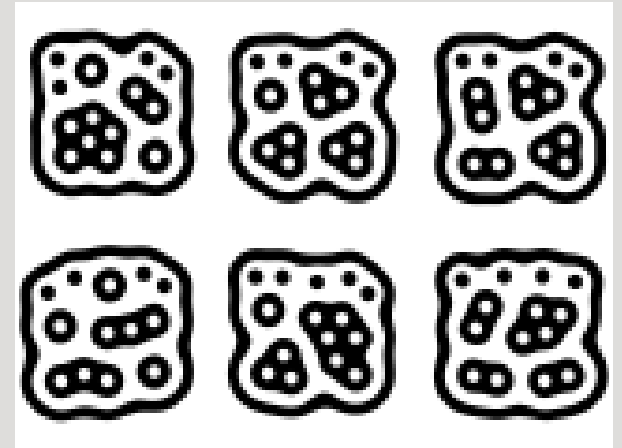
Solution – Project Shale

- Extend the LaserBall project with reactive physical components
    - See saw, Bumper, Sound Emitter
- Wireless communication with components
   - Xbee (Zigbee 802.15.4 mesh networking)

Project Shale: An Example

Steps:

1. Virtual Object (the ball) moves towards the Physical Object (the see saw)

2. Virtual Object and Physical Object collide

3. A) Virtual Object (ball) ricochets off in a different direction
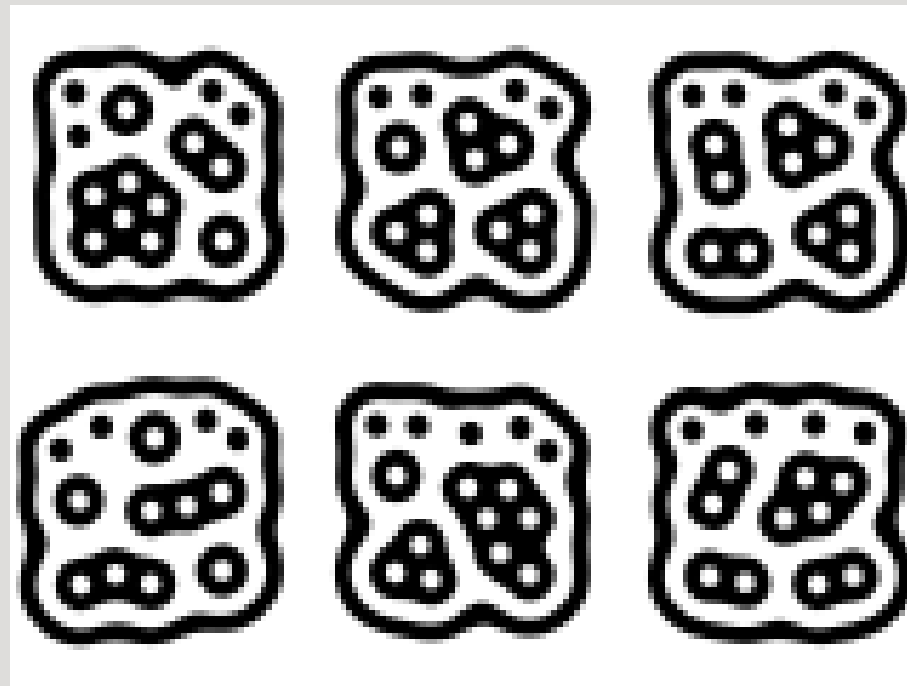   B) Physical Object (see saw) turns in reaction to the collision

Virtual Object: Ball

1

3a

2

Physical Object: See Saw
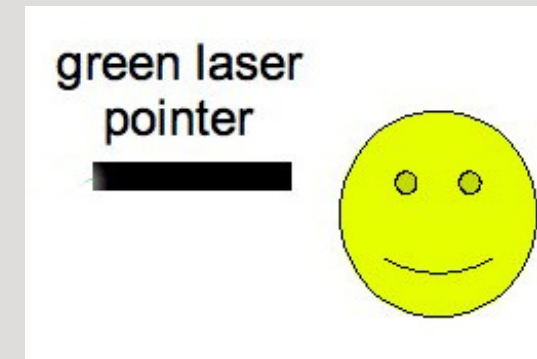
See Saw Fulcrum

3b
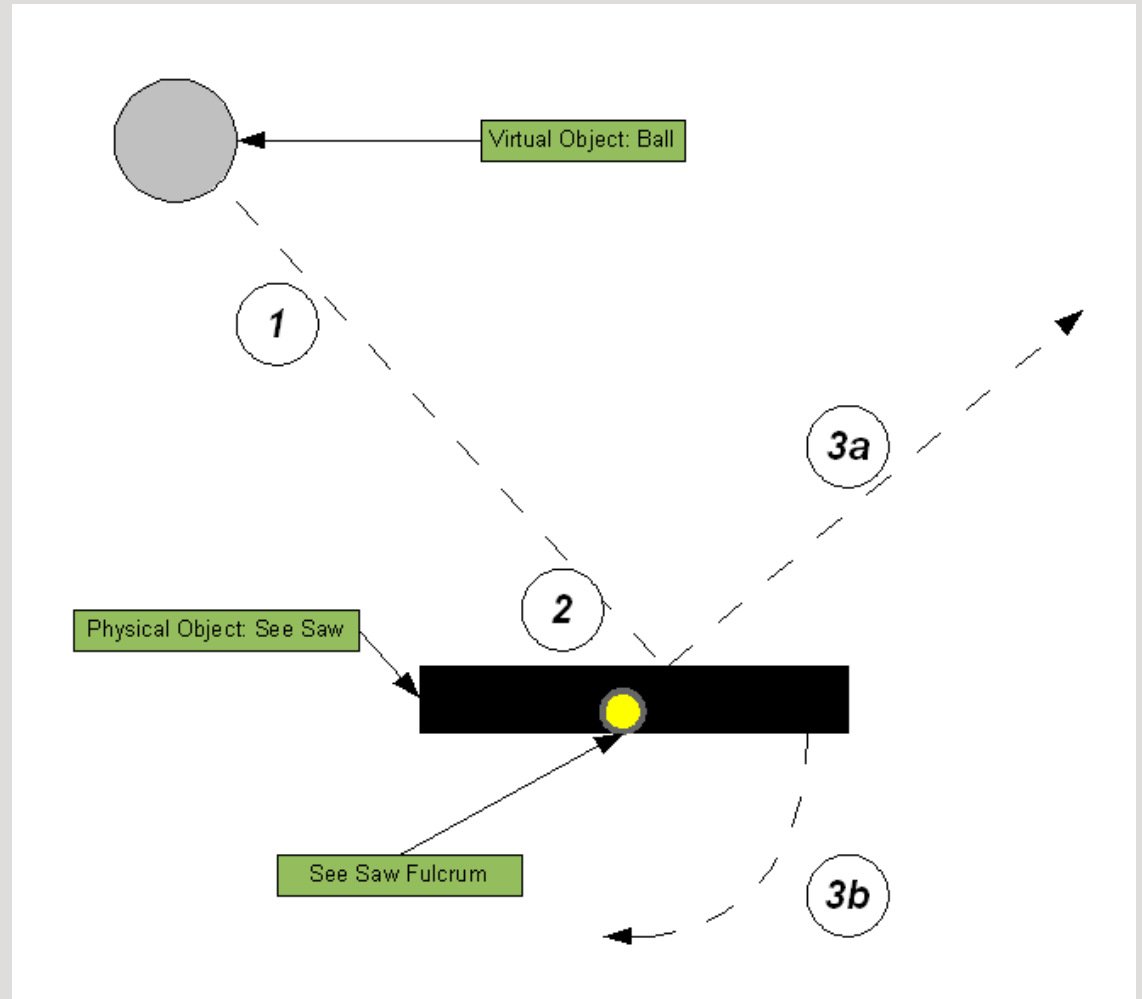
Solution – Project Shale

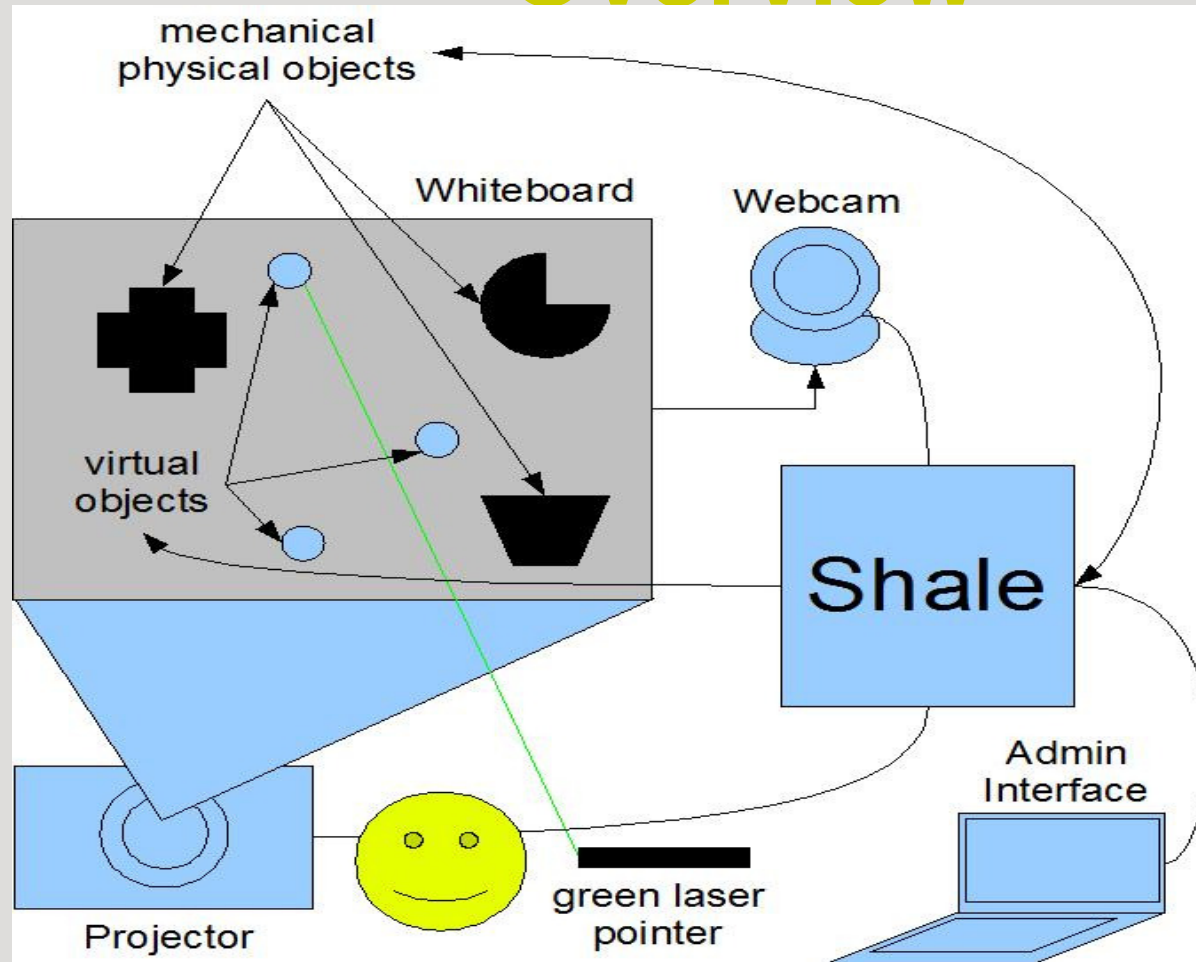- Recognize Physical Objects
  - LED fiducial markers

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  - *Functional Requirements*
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Conceptual Overview

Functional Requirements

- Demonstrate interactions between physical and virtual objects
  - Project virtual objects
  - Detect and control physical objects
  - Respond to user actions
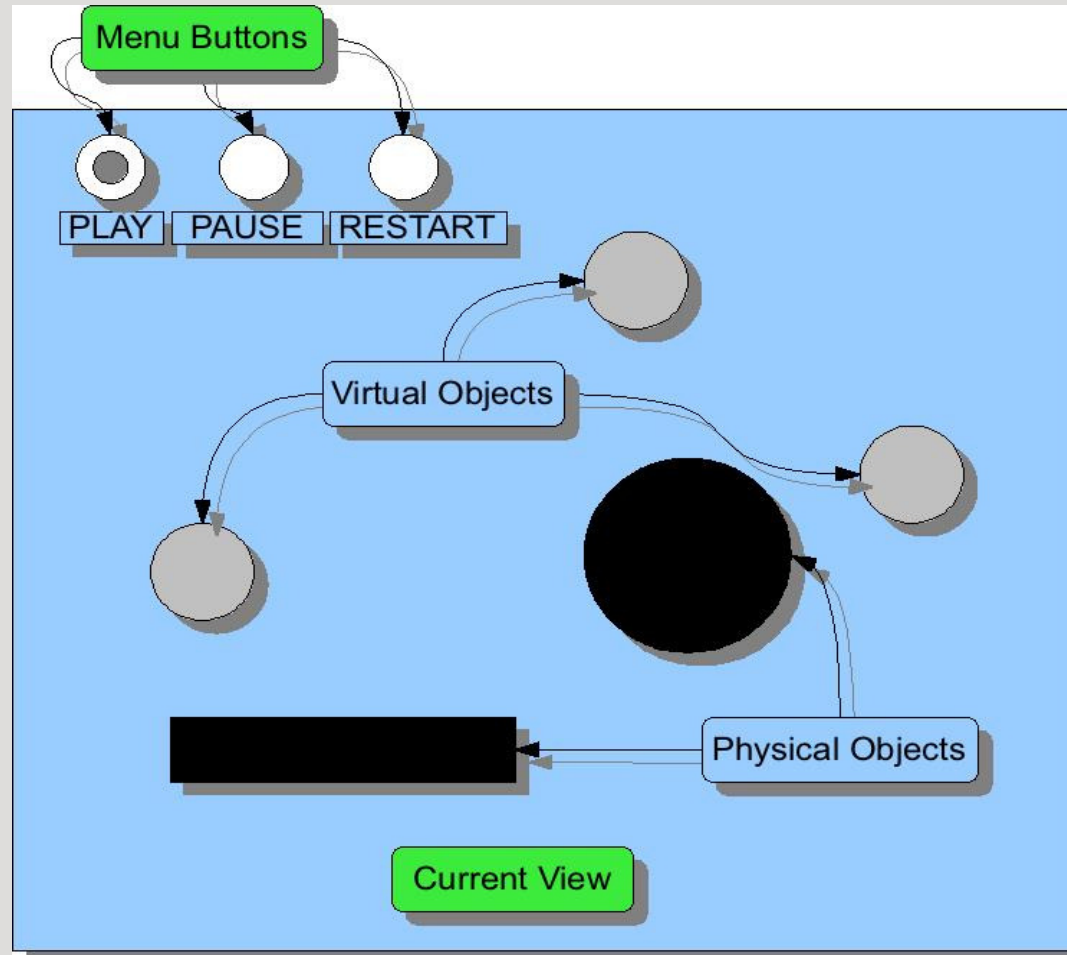- Additional requirements
  - Debugging interface
  - GUI

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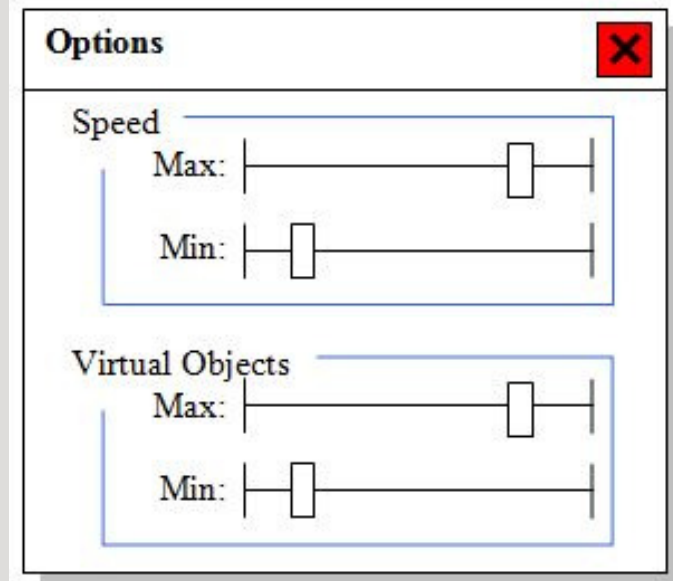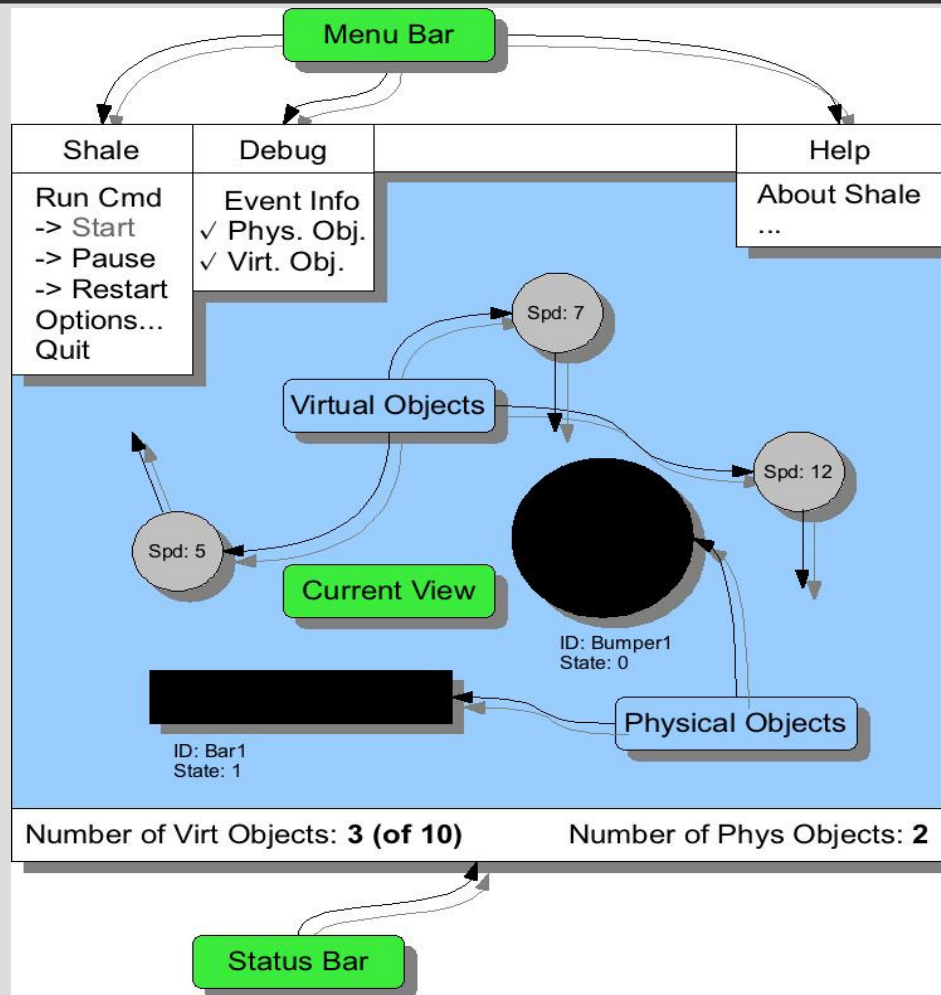
- Summary of Points
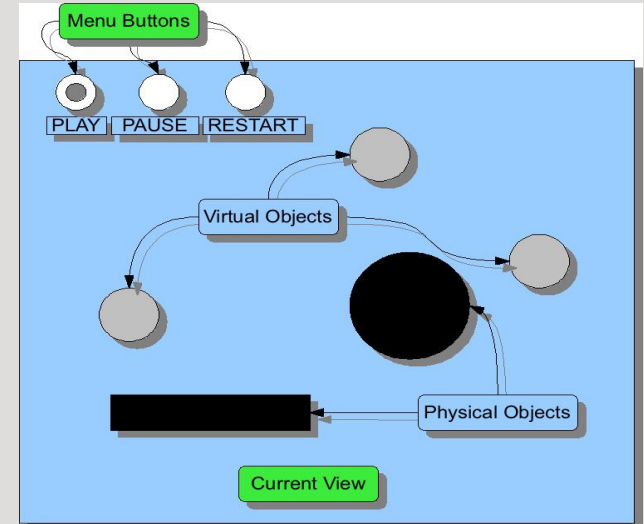
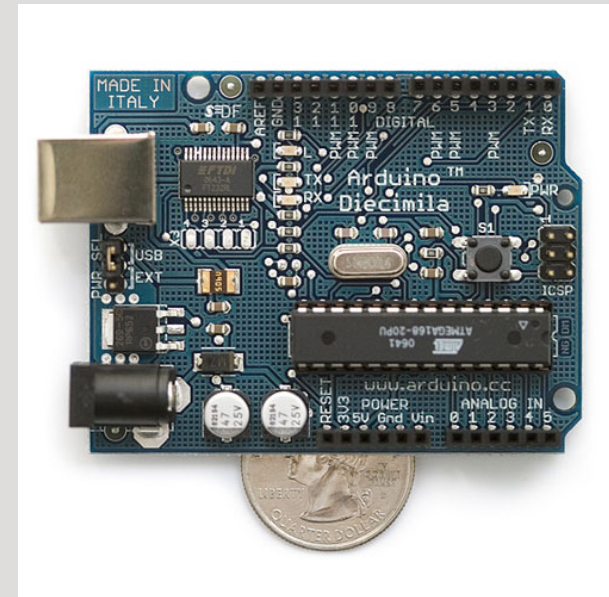# Standard User Interface

Adminstrative Interface

Environmental Requirements

- Development Environment
  - Processing PDE 0135 (Cross-platform)
  - JMyron Image Processing Library
- Hardware
  - Projector
  - Web camera
  - Projection Surface
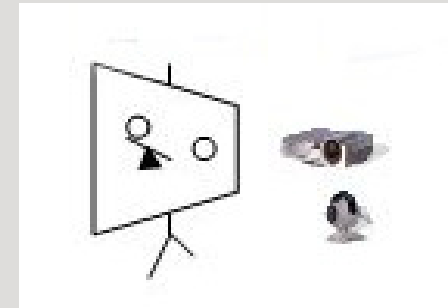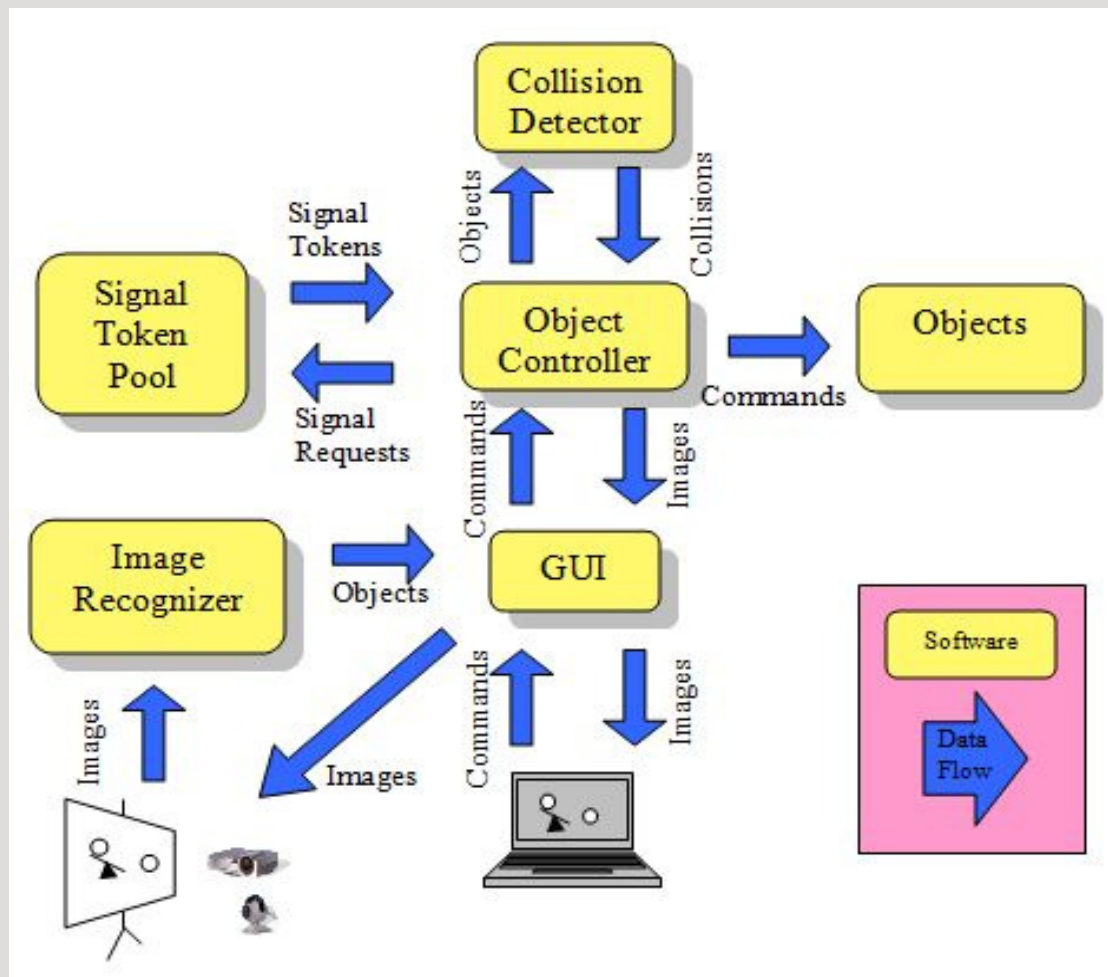 - Laser Pointer
  - Arduino microcontrollers

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- ***Architecture Overview***

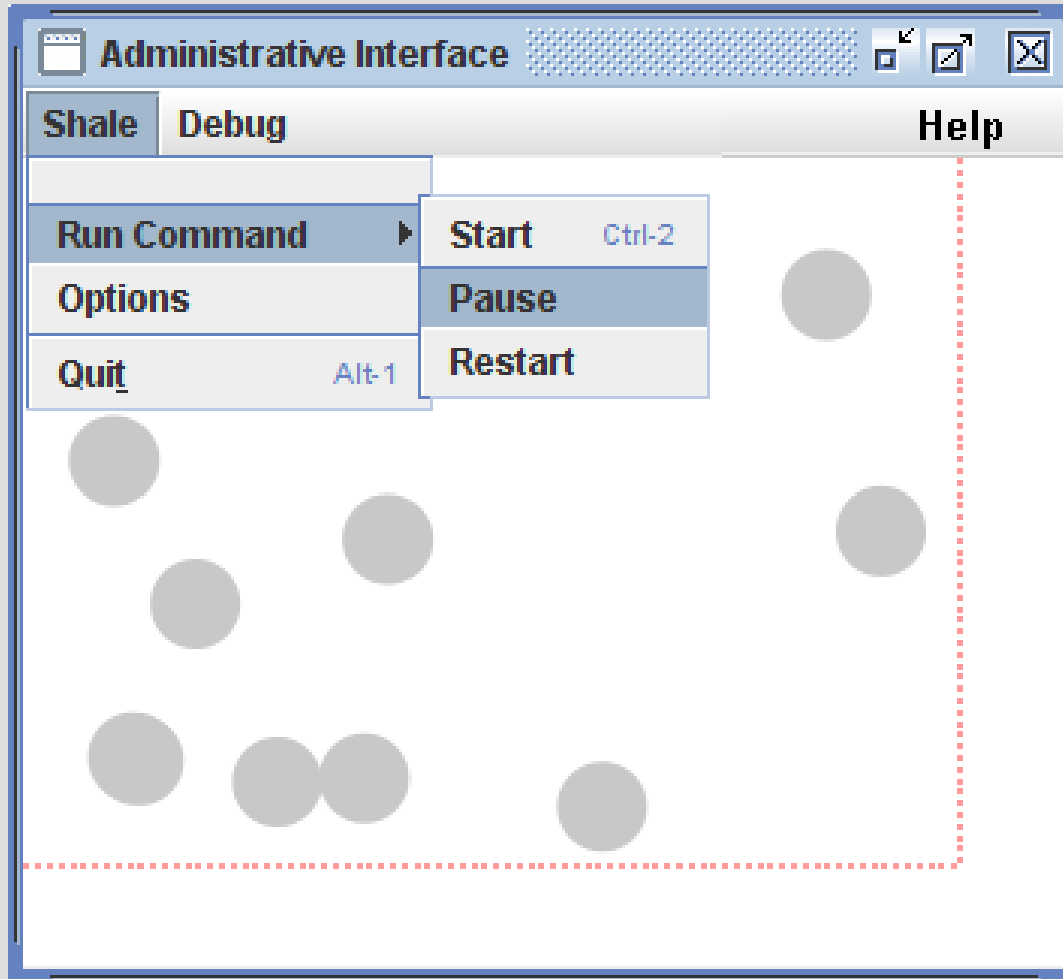- ***Software Demo***

- Summary of Points

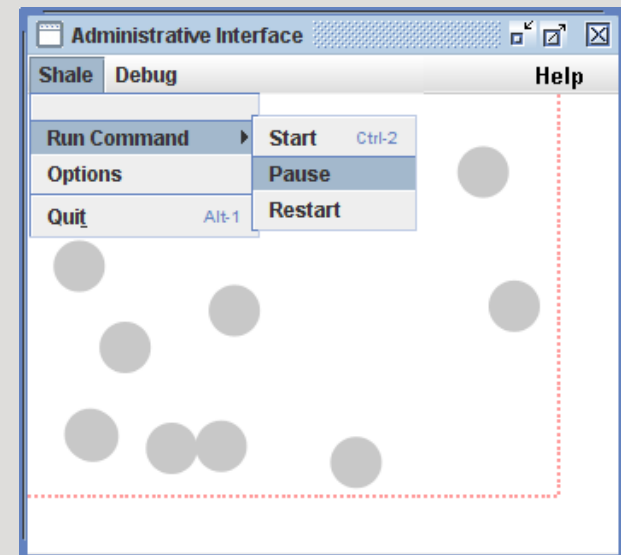# Shale Architecture

Demonstration

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QUESTIONS?