



Laser Pinball

WESTON BRAUN – JAKE ISENHART – PAULINE VARLEY

6.111 FALL 2014

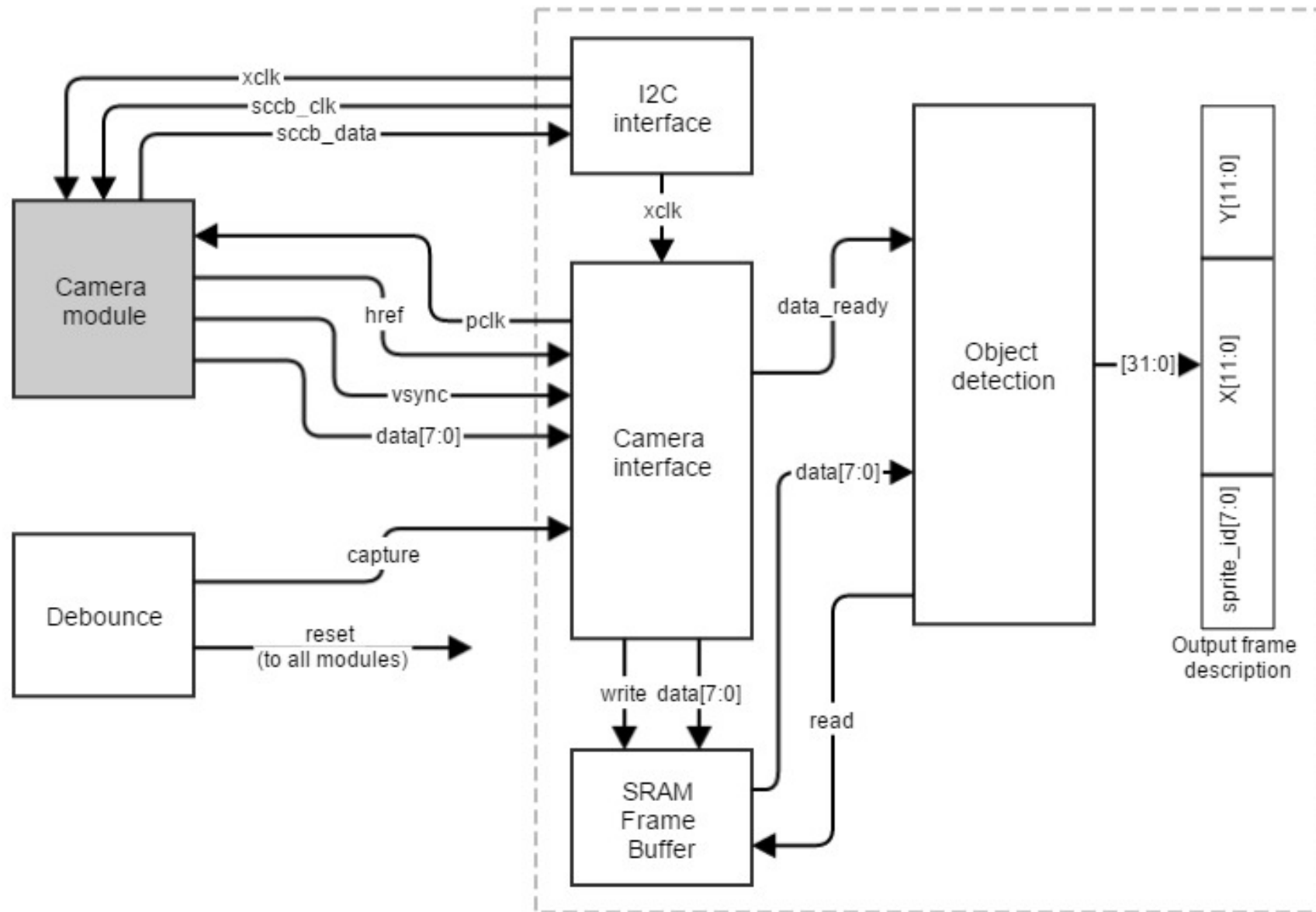
Project Overview

- Reimagined arcade game
- User-customizable
- Three-block implementation:
 - Image processing and camera interface (gameboard recognition)
 - Physics and game engine
 - Laser display driver

Camera interface

- Reads camera image to develop basic game board
- Camera interface (VGA, I2C)
 - Preset camera for correct output (RGB vs chrominance)
 - Camera can be driven between 10 and 48MHz
 - Camera's internal pixel clock based off of system clock; camera interface module can read based on pixel clock
- Memory interface (frame buffer)
- 32-bit interface with game engine to transmit static object locations

Camera Interface and Object Detect Module



Game Engine & Physics

Sprite Lookup

- 8-bit sprite ID – allows for 256 game elements
- Laser projector module will have vector graphics defined for each sprite

Collision Detection

- Collisions with different objects will set specific flags visible to the physics module

Friction and Gravity

- Operations carried out whenever updating the frame, regardless of collision status

User Input

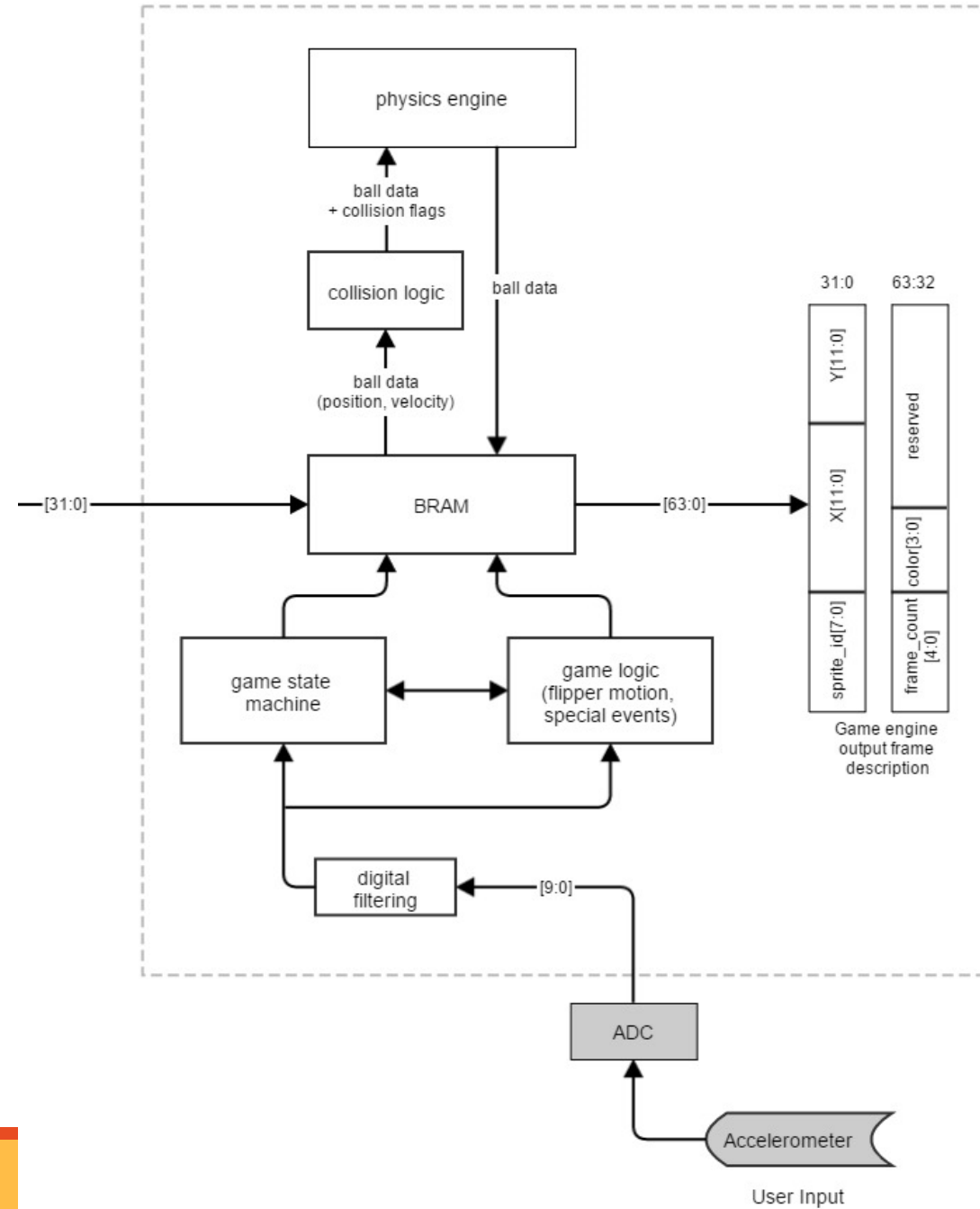
- Game will be controlled by a pair of accelerometers mounted to gloves

Interface to Projector

64 bits per sprite

- [11:0] X coordinate, [11:0] Y coordinate
- [7:0] Sprite ID
- [2:0] Color
- [4:0] Update count
- [23:0] reserved – may later be used for scaling, rotation

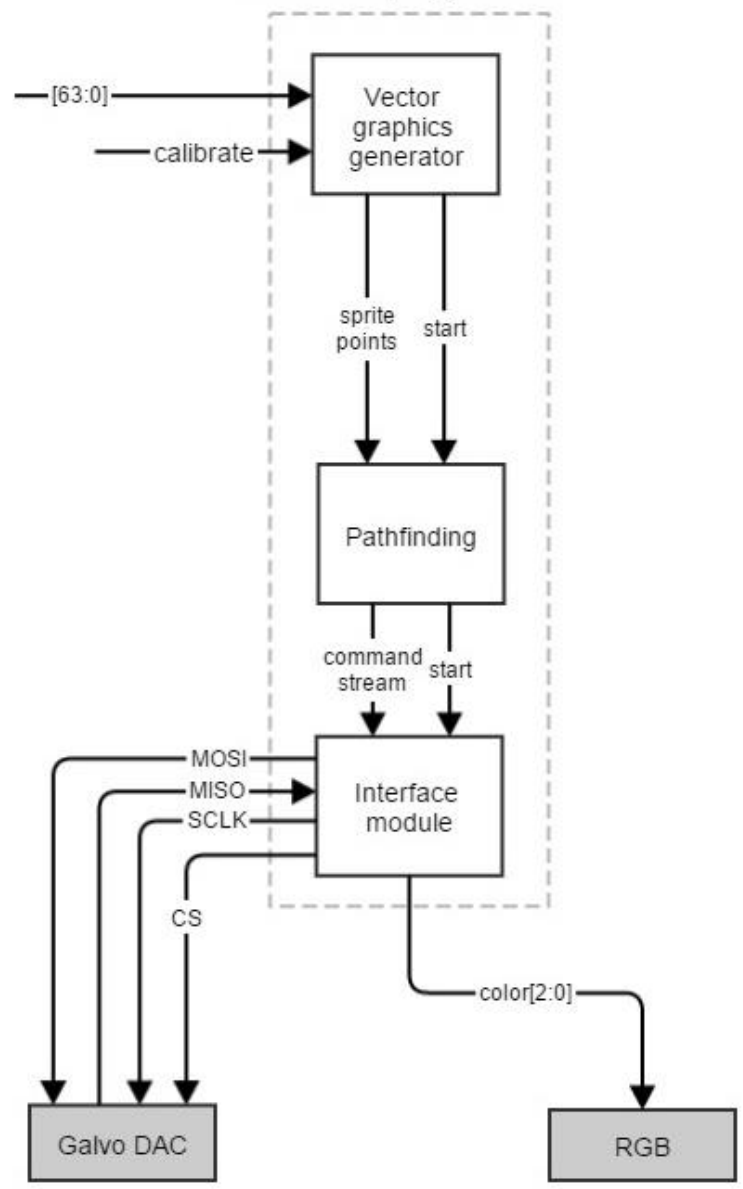
Physics and Game Engine Module



Laser projector display

- Laser projector consists of a RGB laser and galvanometers to steer the beam
- Limited number of points can be plotted in each frame
 - Variable frame rate
- Vector graphics engine translates sprite locations and coordinate sets from the game engine to vectors
- Path finding module optimizes the plotted path
- Galvanometer position set with SPI DAC, laser color set over a parallel interface.

Laser Display Module



Timeline

	10/27	11/3	11/10	11/17	11/24	12/1	12/8
Proposal and planning							
Source components							
Camera interface and object recognition							
Physics design and development							
Camera and game engine interface							
Galvo testing							
Game engine and display module interface							
Pathfinding							
Bonuses (calibration, sound effects, accelerometers)							
Debugging and final touches							

Pauline
Jake
Weston