Snappa Referee

Enjoy what’s great, without any debate

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Demo

- Hard to judge height validity
- Difficult to reach a consensus
- No gaming atmosphere
A Referee. A Solution

- Video system with ball tracking determines whether ball is high enough or not
- User-friendly interface to set line threshold points
- Replay available for ball’s movement
- Gaming sounds and scoreboard to enhance playtime
System Modules

- NTSC Input Conversion
- User Inputs
- Referee and Game Logic
- Ball Detection
- Shot Memory
- Display Image
- Outputs

Connectors: RGB, HSV

Height: ✔ 3 - 5
Inputs

User Inputs

- Start, Reset, Points
- Threshold set-up
- Replay

Camera Input

- Image data received as $Y C_B C_R$
- Transformed to RGB for display and to HSV for ball-detection
Visual Modules

Ball Detection
- Uses HSV for tracking
- Midpoint of Ball fed to Referee Module
- Tracked movement stored for Replay memory

Display Image
- Displays onto monitor the visual input of the camera
- Module transforms $Y_C B_C R$ to RGB
Referee Finite State Machine

Referee Module

- FSM decides validity of throw based on threshold lines and ball position
- Defines the end of a throw for memory-allocation purposes

States:
- #1 Start
- #2 Idle
- #3 Record
- #4 Replay
- #5 Game-over

Transitions:
- Turn-on/Reset Button to #1 Start
- #1 Start to #2 Idle
- #2 Idle to #1 Start
- #2 Idle to #3 Record
- #2 Idle to #4 Replay
- #2 Idle to #5 Game-over
- #3 Record to Start Button
- #4 Replay to Shot ends
- #5 Game-over to 7 points
- #5 Game-over to #2 Idle
Gaming Atmosphere

Scoreboard Module

- Displays a scoreboard for easy point-tracking
- Player input

Achievement Sounds

- Game start, game finished, shot validity

3 - 5

LOW!!!
# Timetable

<table>
<thead>
<tr>
<th>Week</th>
<th>Implementation</th>
<th>Testing</th>
<th>Writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/1 - 11/7</td>
<td>Finish off Design decisions (utilize Lakit, NTSC camera, and manageable replay)</td>
<td>None</td>
<td>Project Proposal Draft Revision, Prepare for Project Presentation, Block Diagram Meeting</td>
</tr>
<tr>
<td>11/8 - 11/14</td>
<td>Ball and Background tracking, start Referee Logic Module</td>
<td>Debugging of video tracking modules (edge cases, different colors)</td>
<td>Project Proposal Due, Project Presentations, Revise Block Diagram Meeting</td>
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<tr>
<td>11/15 - 11/21</td>
<td>Referee Logic Module, Scoreboard Block</td>
<td>Debugging of Referee Logic (state switching)</td>
<td>Project Checkoff Checklist Meeting</td>
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<tr>
<td>11/22 - 11/28</td>
<td>Memory Replay, Basic Sound Effects</td>
<td>Memory Replay test benches</td>
<td>None</td>
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<tr>
<td>11/29 - 12/05</td>
<td>Stretch Goals (motion sensors)</td>
<td>Debugging</td>
<td>Project Status Update with Mentor</td>
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<tr>
<td>11/6 - 11/11</td>
<td>None</td>
<td>Debugging for Check-off</td>
<td>Check-off due, Project Report due, Video of Projects</td>
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Complications

Encountered

- Memory constraints for video replay
- Limitations due to single point of reference
  - Side detection and stretch goals

Anticipated

- Not constricting original gameplay
  - Quick object detection
- Determining the end of a shot
Snapp’on your camera and enjoy!