TOKYO INSTITUTE OF TECHNOLOGY
COMPUTER SCIENCE DEPARTMENT

Infection Net

AN AUGMENTED REALITY GAME

with Koike laboratory

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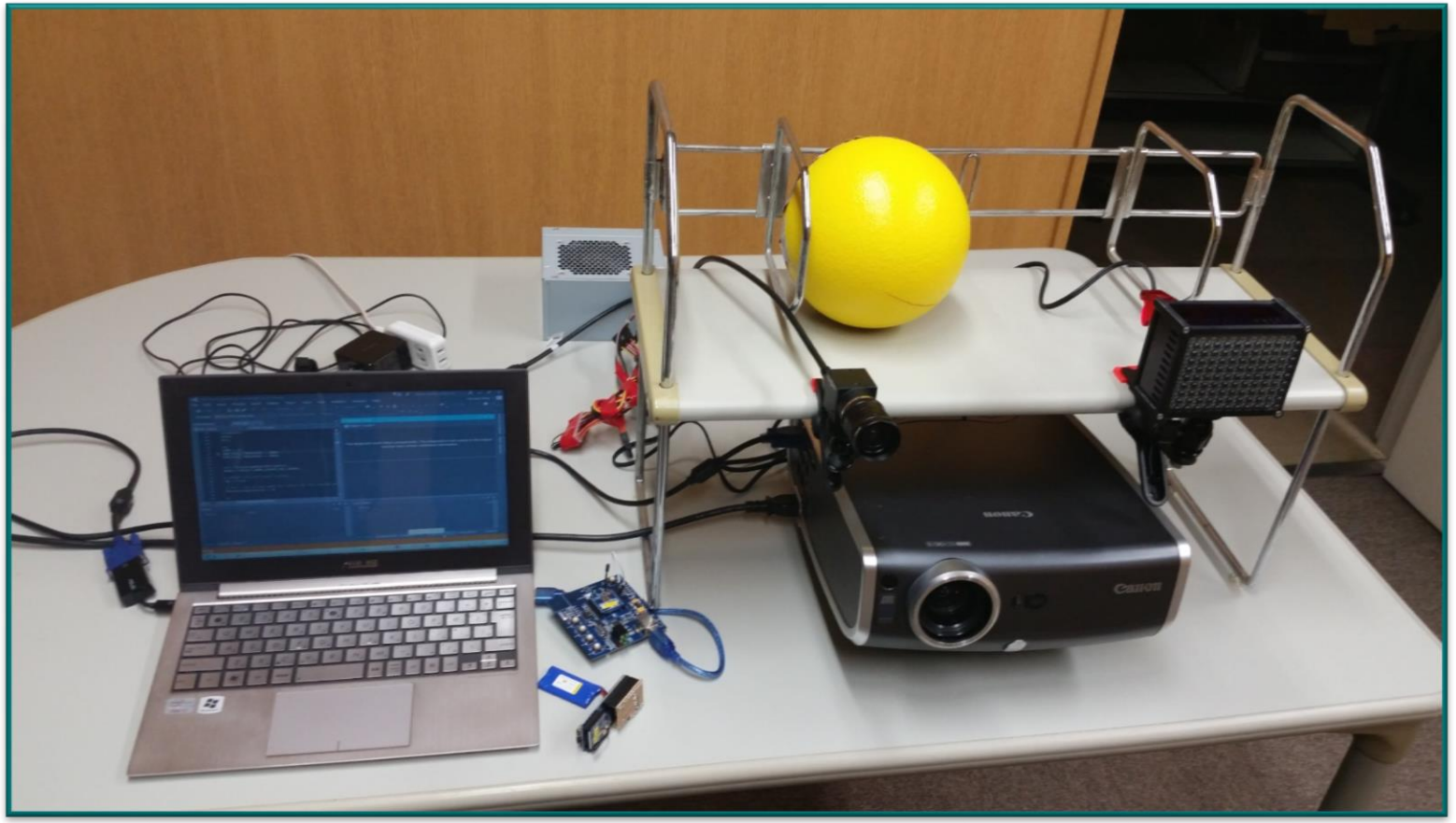
unity OpenCV ARDUINO

CONTENT

- Demo of our prototype.
- Project overview & Subprojects assignment.
- Design details of each subproject.
- Implementation of the prototype.

PROTOTYPE DEMO \ Setup



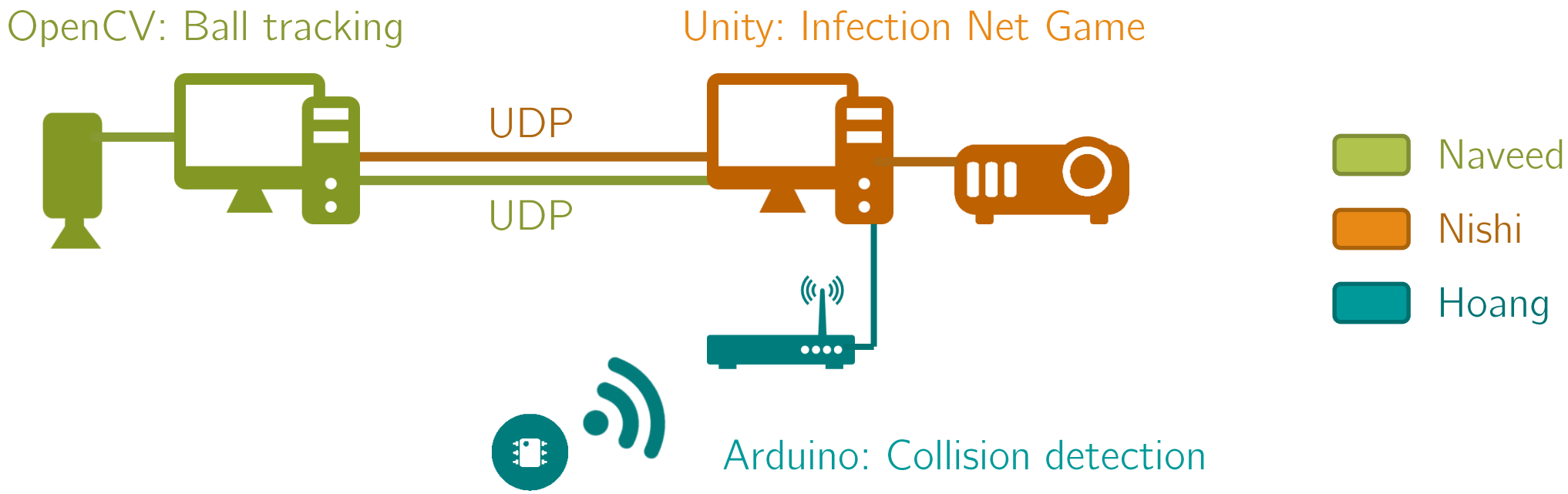
- IR Camera to track ball position (2D).
- Sensors to detect: Falling, collision, single tap, double tap.

PROTOTYPE DEMO \ Video

[DEMO VIDEO]

- Hitting nodes to stop the disease spreading.
- Spin ball and hit nodes to earn extra bonus.
- Double tap the ball to activate Power Ball when it is available.

PROJECT OVERVIEW \ Top Level



DESIGN DETAIL \ OpenCV: Ball tracking

Naveed Afzal

Two modes of operation:

Calibration → Screen size from Game → **Tracking**

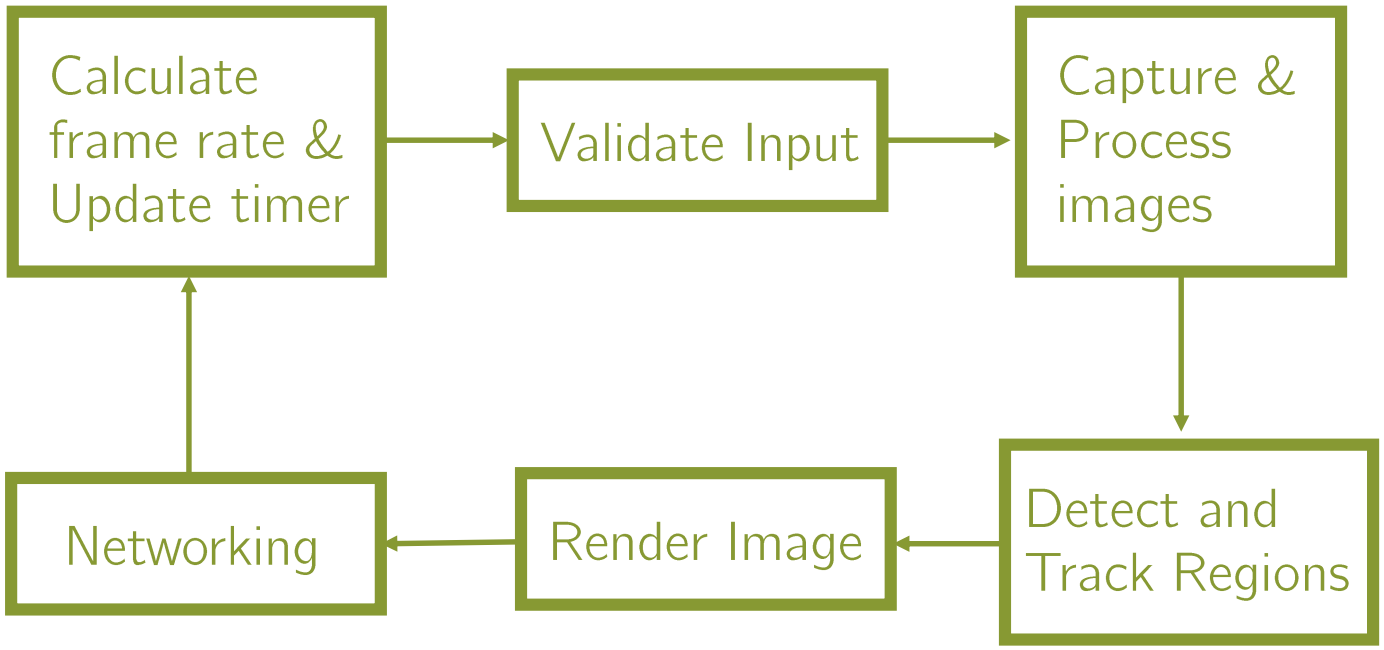
- Determines camera shutter speed, binarizing threshold, region detection thresholds.
- System detects 4 small sized regions on screen as 4 corner point.
- Calculate homographic transformation from distorted image to rectangular Unity game.

- Sets up appropriate parameters for detecting the ball corresponding with its size.
- Systems tracks the ball position and send the transformed coordinate tuple (x, y) to Unity game machine using UDP protocol.

DESIGN DETAIL \ OpenCV: Ball tracking

Naveed Afzal

OpenCV Loop:



DESIGN DETAIL \ Unity: Infection Net

Fumito Nishi

Agenda:

- Implemented a simple point clicking game.
- Implemented the Infection Net game with Unity.

Why the game?

- Throwing ball to “destroy” something is “intuitive”.
- Inspired by Epidemic Network model.
- Throwing ball to “kill off” disease is fun!

DESIGN DETAIL \ Unity: Infection Net

Fumito Nishi

Game design:

- Model Classes: Node, Network, Game.
- View and Controller are supported by Unity (C# script).

Game rule:

- Infection spreads once a hit, but if the ball spin is detected, the infection is not spread.
- Kill ball can eliminate the infected node.
- Game score is determined by the number of survivors.

DESIGN DETAIL \ Arduino: Digital ball

Hoang Nguyen

Hardware:

- Arduino Fio, Xbee S2, Sparkfun's 6DOF sensor.
- XBIB-U-DEV Rev.3, Xbee S2 (Connect to game PC).

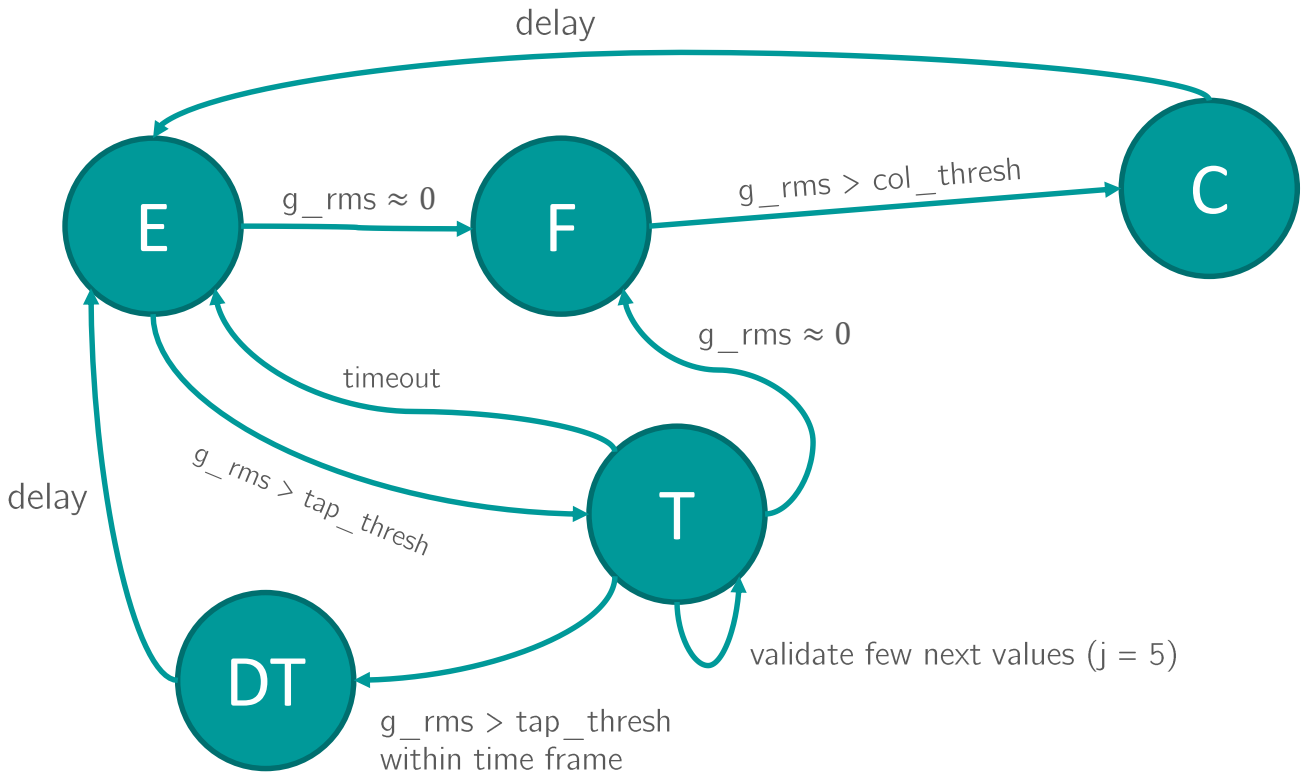
Functions:

- Accelerometer: Detect free fall motion, collision, user's tap and double tap using RMS of gx, gy, gz.
- Gyroscope: Convert to quaternions and use the rotation component to measure spin.

DESIGN DETAIL \ Arduino: Digital ball

Hoang Nguyen

State-based motion detection:



PBL Fall 2015: Infection Net – An augmented reality game.

THANK YOU FOR LISTENING

This presentation file and source code is available at:

`https://github.com/gear/PLB-2015F-ARGame`