Robotic Club Project's Proposal

Interactive LED screen

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I. System Overview

(1a) Body gesture

(1b) Hand gesture

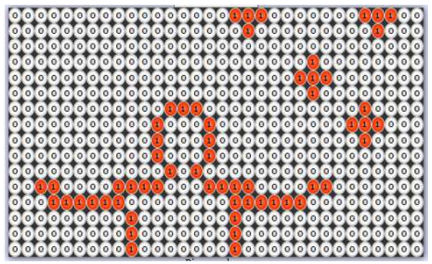
Input

(2)Raspberry Pi and Camera

Using open CV to get the human body/hand

Processing

(3) LED panel



Playing the interactive games in real-time

Output

II. User case (1) – active mode

1. Detect the human by ultrasonic sensors.
2. Take picture of human body.
3. Get contour of human body by using Raspberry Pi and OpenCV library
4. Display the contour on LED panel in real-time
5. When users stand in front of LED panel, it allows users play some interactive games such as Tetris, Snake, Rock paper scissors, Dunk Ball … etc

II. User case(2) – Idle mode

1. Display the current clock (EST, Indian, Chinese time …)
2. Display the current weather information.
3. Display the motivational quotes in multiple languages.
4. Etc…

III. Design plan

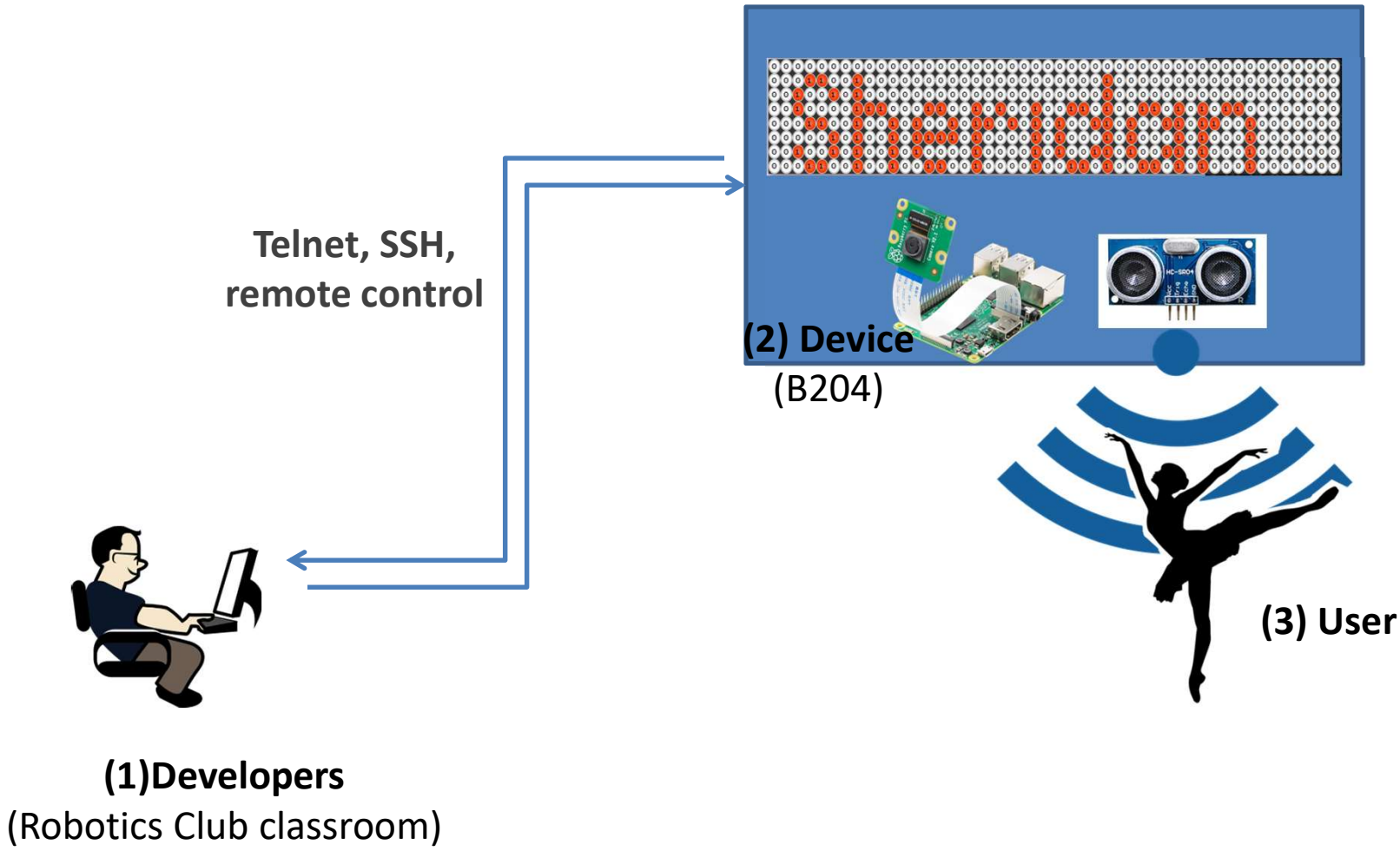
Hardware:

- Rasperry Pi, Camera,
- Arduino and LED matrix
- Ultrasonic sensor
- Power supply adapter and accessories

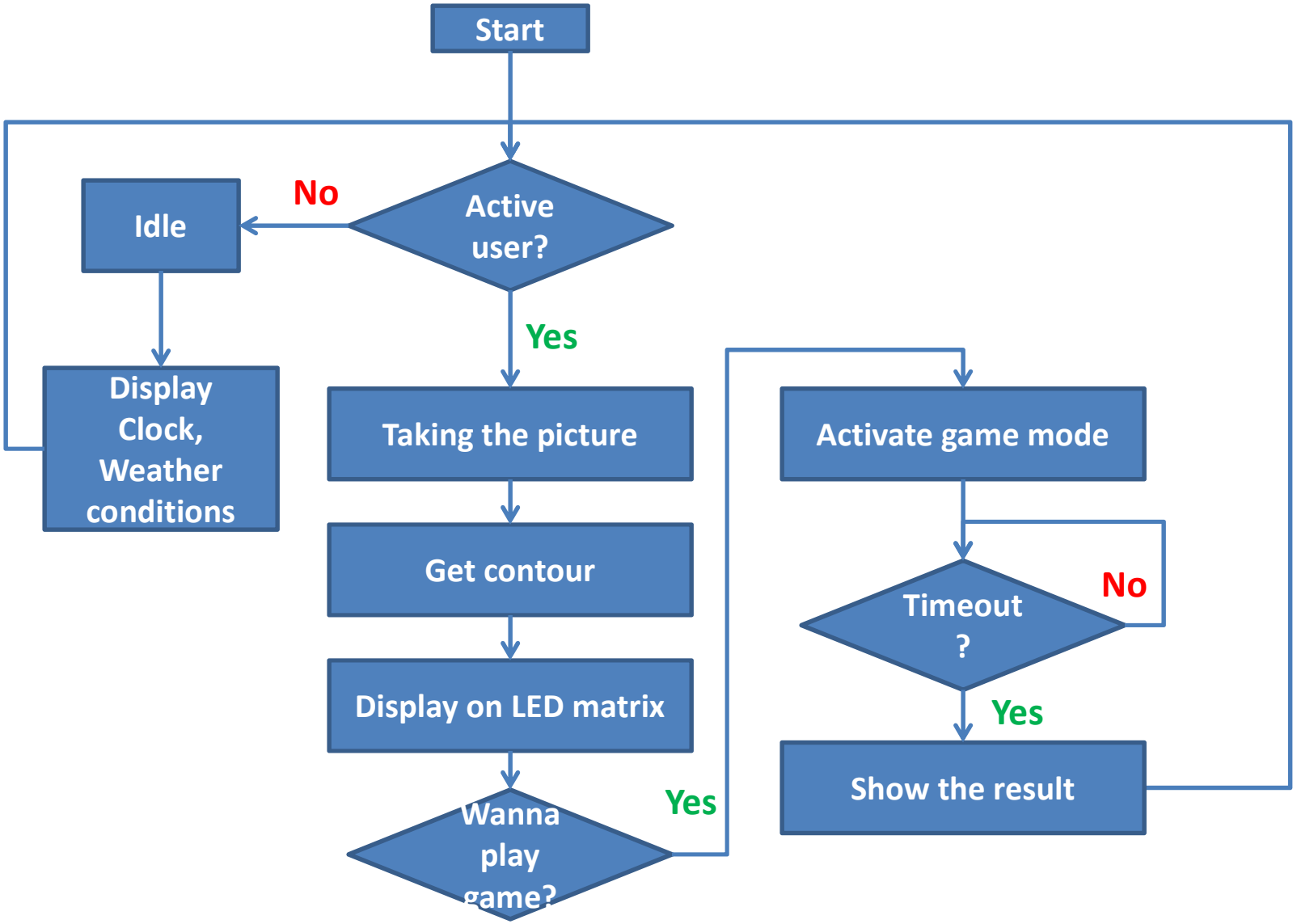
Software:

- OS: Raspberry Pi
- Programing language: Python, Script, C/C++
- Library:
  - OpenCV (Related to Hand Gesture Recognition, Human Gesture Recognition).
  - TensorFlow

III. Development environment



III. Design plan - Flowchart diagram



III. Design plan - BOM

No	Item	QTy	Price	Sum	Description	Remark
1	Rasperry Pi 4 and accessories	2	$49.85	99.7	https://www.digikey.ca/short/jnv5vq5c	
2	Camera 8M	2	$15.03	30.06	https://www.digikey.ca/short/r7zpz4q5	
3	LED matrix panel	2	$98.61	197.22	https://www.digikey.ca/short/nqbmz070	Depend on size of screen
4	Human detection sensor PIR motion detector	2	$8.19	16.38	https://www.digikey.ca/short/q9wrp704	
5	Ultrasonic sensor	4	$6.83	27.32	https://www.digikey.ca/short/zqb9wfd7	Depend on size of screen
6	Power supply	2	$18.00	36	https://www.digikey.ca/short/f9dv2tr9	Depend on size of screen
7	Others	1	$200.00	200		Enclosure, frame, wire
				$606.68		

IV. References (TBD)

https://www.riyas.org/2013/12/online-led-matrix-font-generator-with.html
https://docs.opencv.org/4.x/d4/d73/tutorial_py_contours_begin.html

Pose Estimation on the Raspberry Pi 4
https://github.com/ecd1012/rpi_pose_estimation

https://www.digikey.ca/en/maker/tutorials/2022/introduction-to-image-processing-raspberry-pi

https://www.cl.cam.ac.uk/projects/raspberrypi/tutorials/image-processing/

Alternative solution by ESP32
https://www.digikey.ca/short/9b3ft5n2

Adafruit RGB Matrix Bonnet for Raspberry Pi
https://www.adafruit.com/product/3211