

Gesture Recognizer Strap using Motion Sensor

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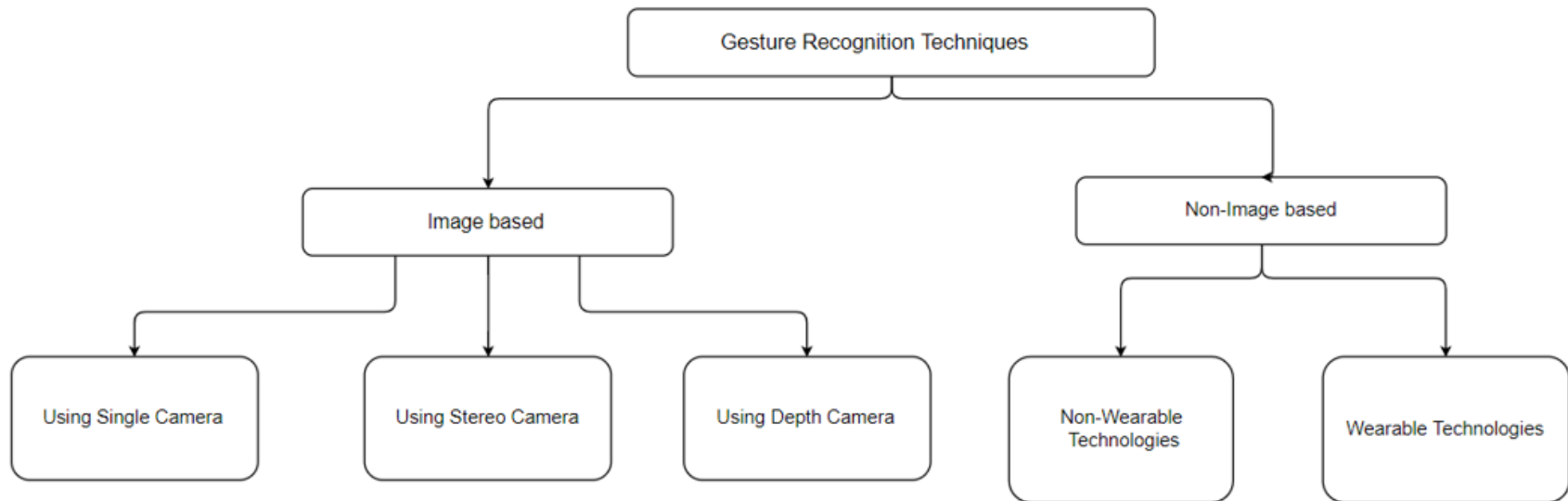
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Problem:Gesture Recognition

- ▶ Gestures are crucial part of human communication
- ▶ Gestures can be defined as meaningful body motions
- ▶ Scientists think it to use gestures and postures for human and computer (or robot) interaction.



Analysis: Gesture Recognition Techniques



Analysis:Image Based

Technology	Advantages	Disadvantages
Single Camera	Easy Setup	Low robustness
Stereo Camera	Robust	Computational Complexity, calibration difficulties
Depth Sensor (ToF Camera)	High Frame Rate	Resolution depends on the light power and reflection

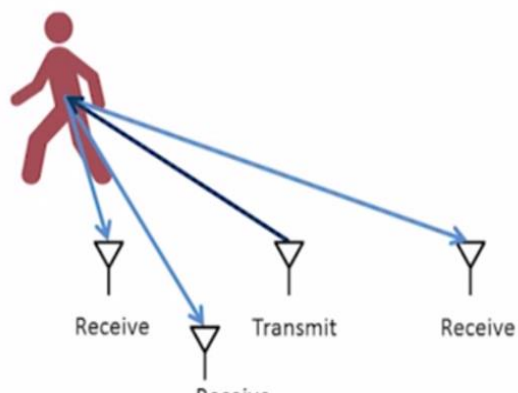


Analysis: Non-Image Based

► Non-Wearable Technology

WiTrack

3D Motion Tracking Using Body Radio Reflections



Analysis: Non-Image Based

► Wearable Technology

Used Technology	Advantages	Disadvantages
Glove (wearable)	Fast response, precise tracking	Cumbersome device with a load of cables
Band (wearable)	Fast response, large sensing area	Contact with human body



Analysis

Comp. Factor	Glove	Band	Camera	Depth
Cost	Cheaper	Cheaper	Costly	Cheaper
User Comfort	low	Average	good	good
Computing Power	Low	Low	High	High
Accuracy	High	High	High	High
Noise	Average	Average	Minimal	Minimal

Solution

- ▶ This project aims to develop low-cost, multi-purpose control device.
- ▶ A wristband as wearable device for using to identify the human gestures.
- ▶ This wristband has its own accelerometer, gyroscope and compass sensor to determine the orientation of the object.

Solution: Summary of Software Requirements

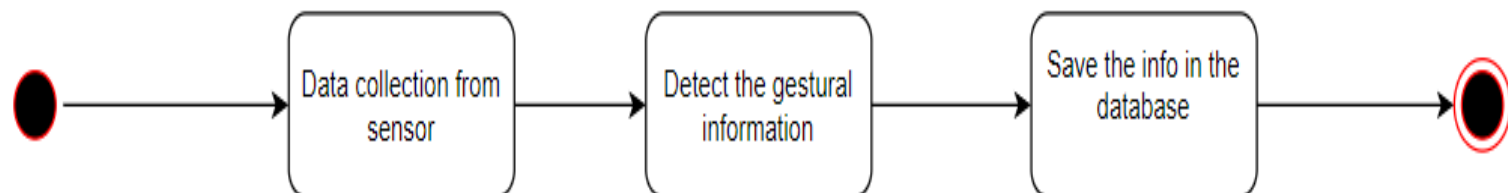
- Data collection from sensors
- Detection of gestural information
- Saving the gestural information
- Comparison of 2 different gestural information
- Giving response to the user
- Additionally, to develop an api for UNITY 3D is desirable.

Solution : Activity Diagram

2 modes:

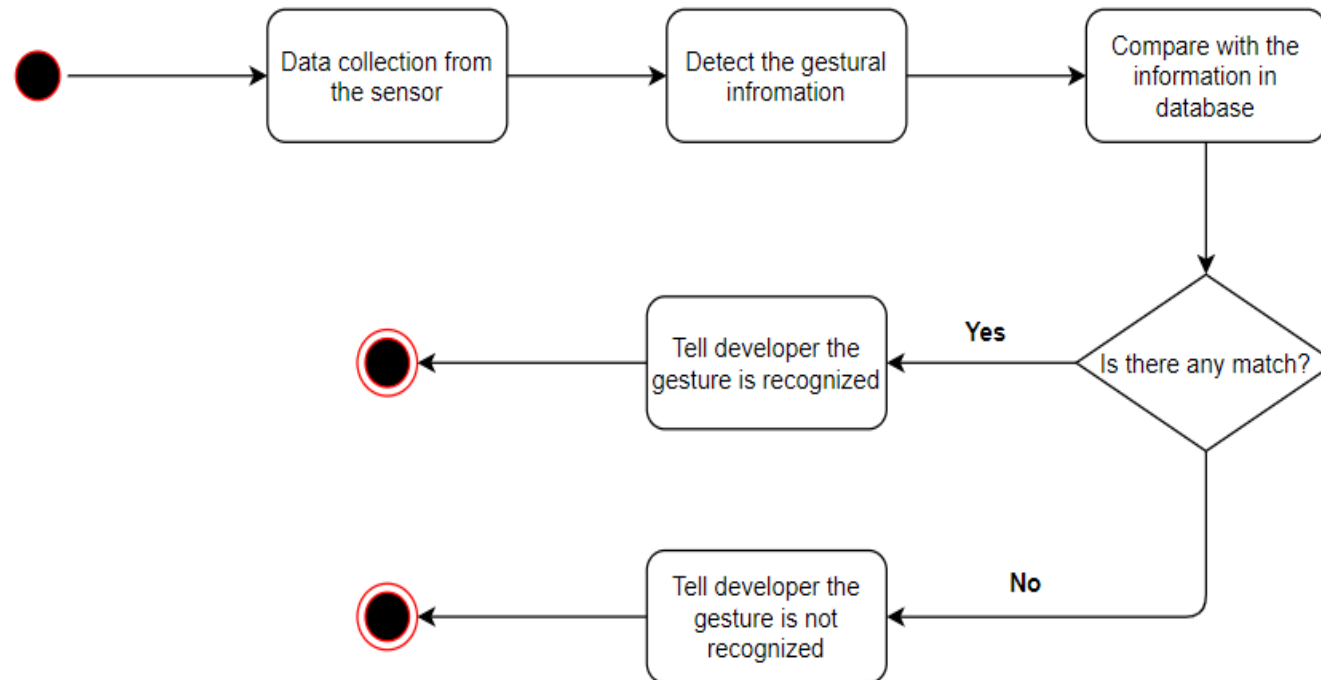
1. Training Mode
2. Testing Mode

► Activity Diagram of Training Mode



Solution: Activity Diagram

► Activity Diagram of Testing Mode



Solution: Algorithms

Feature extraction

- Creating Template

Recognition

- Explicit Comparison
- Distance Measurement
- Dynamic Time Warping

Solution: Technical Details

- ▶ Programming Language will be C++
- ▶ Works on Windows Operating System
- ▶ The data will be hold in the JSON objects.

Results and Conclusions

- ▶ Purpose : Multicontroller device with gesture recognition technology
- ▶ Solution: Using Wearable Technology
 - MyAhrs+ Sensor(Gyroscope, Acceleration, Compass)
 - Wrisband as Wearable device
- ▶ This Project is still in progress

References

- ▶ W. L. Liu H., «Gesture recognition for human-robot collaboration: A review,» *Industrial Ergonomics*, 2017.
- ▶ J. Joseph J. LaViola, «A Survey of Hand Posture and Gesture Recognition Techniques and Technology,» Brown University Providence, , RI,USA, 1999.
- ▶ R. Vadehra, «Gesture Recognition Technology».
- ▶ B. F. e. al., «3D Human Gesture Capturing and Recognition by the IMMU-based data glove,» *Neurocomputing*, 2017.

- ▶ Thank you for Listening
- ▶ Questions?