

GESTURE RECOGNITION & CONTROL

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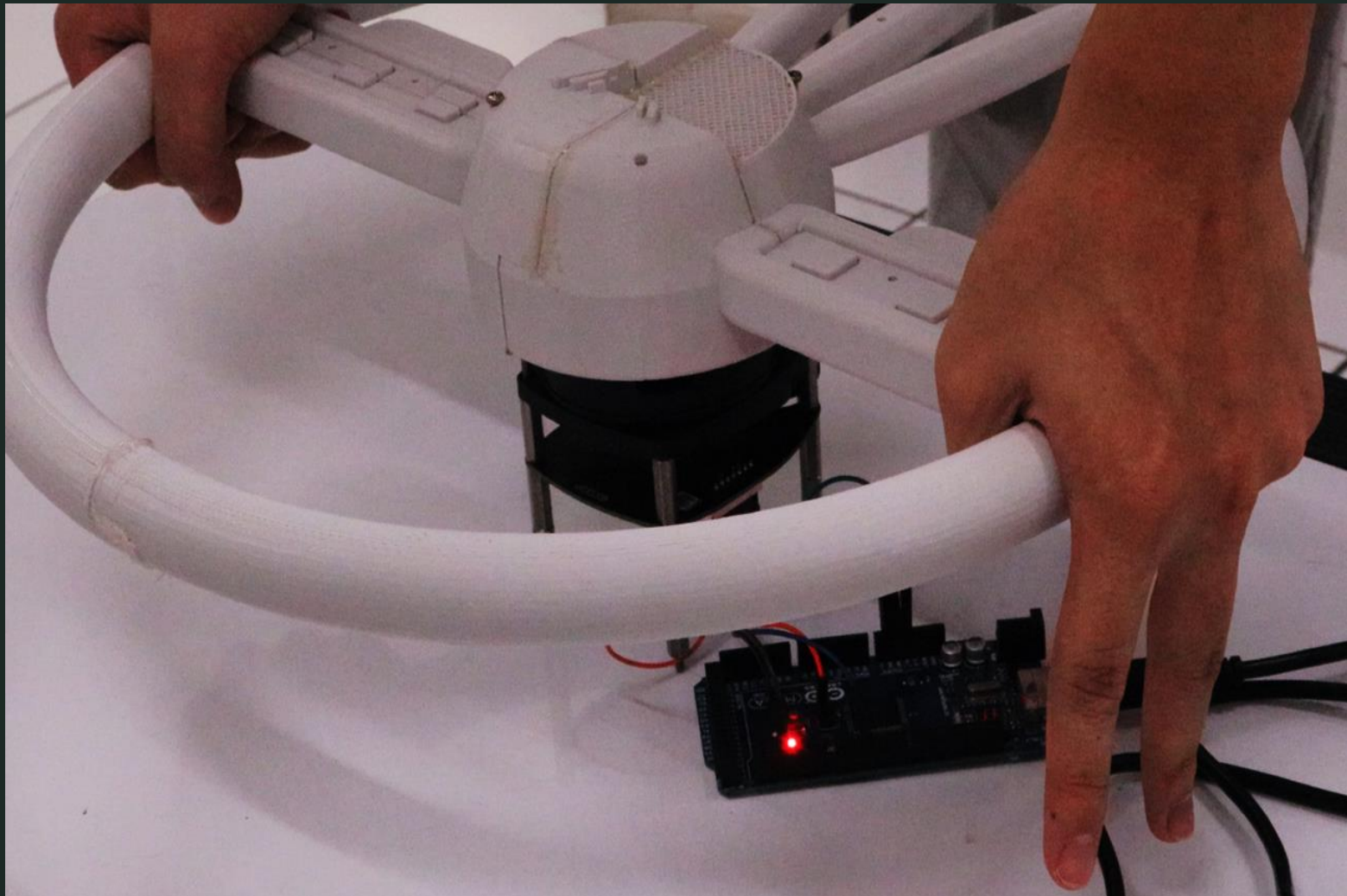
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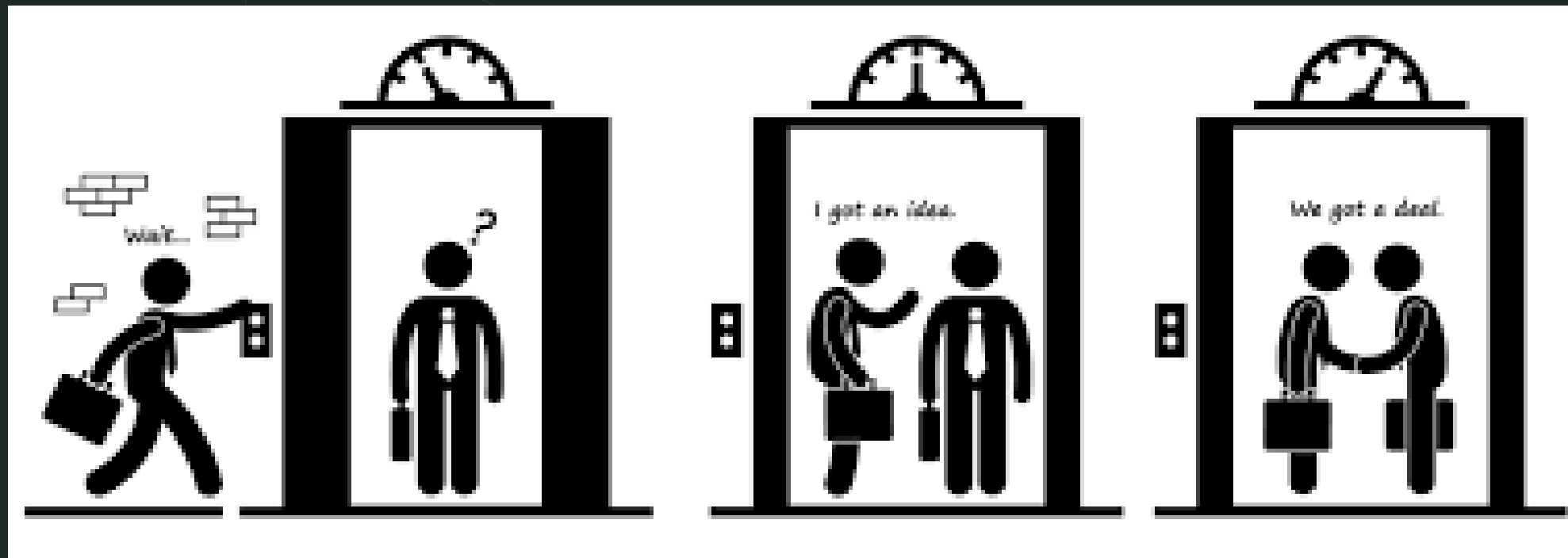
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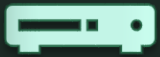
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DEFINITION & TERMINOLOGIES



Infotainment System

The collection of hardware and software in automobiles that provides audio or video entertainment.



Gesture

A specific and unique combination of hand patterns and/or movements.



Recognition

To differentiate one from another.



Control

To give input & receive a pre-determined output.

PROBLEM STATEMENT



Problem

Distracted drivers are one of the main cause of road accidents



Issue addressed

Visual and manual distraction during driving



Relevance

Reduces road accidents



Objectives

To control the infotainment system in the car without requiring visual attention



Our solution

Finger gesture recognition and control of infotainment system in cars

CURRENT SOLUTIONS & LIMITATION



Cell Phone Blocking Technology

Block calls & notification when car is in motion

Limitations:

Locks down phone functionality

(Driver may not like it)



Car safety features

Examples:

- Lane-Departure Warning (LDW)
- Automatic Emergency Braking
- Driver monitoring systems

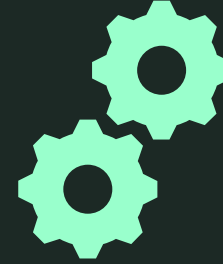
Limitations:

Prevents accidents, not distractions



Our Solution

- Gesture recognition and control to access the infotainment system
- Six static gestures for basics controls



Why it is better?

- Prevent visual & manual distractions while driving
- Retains functionalities of the infotainment system
- Customizable

USER DEMO





USER FEEDBACK





Target segment

Car drivers with no disability in fingers movement and are safety conscious



Impact

Holistic Human-Machine Interface
Reduces road accidents due to distractions

TECHNICAL PRESENTATION



TECHNOLOGIES USED

LiDAR Sensor

- Model: RPLiDAR A1M8
- Function: Provide 360-degree laser range scanning
- Reason being chosen:
 - Not affected by light
 - Relatively easy to configure

3D Printing

- To print out a prototype steering wheel with a space accommodated for the sensor

TECHNOLOGIES USED

Arduino

- To collect, interpret and send sensor data from the LiDAR sensor to MATLAB

MATLAB

- To analyse the sensor data to be able to detect gesture
- Show feedback (simulating output of infotainment system) via the designed MATLAB app

RESULTS & DISSCUSSION

Results

- Detect up to 6 different static gestures
- Accuracy: 90%
- Average response time: 4 seconds
- Independent of lighting conditions
- Robust against noise

Discussion

- Achieves aim (preventing distractions while driving)
 - Gesture can be posted while holding onto the steering wheel
- Possible improvement:
 - Detect more than 6 static gestures.
 - Recognize dynamic gestures
 - Shorter response time
 - Design a direct communication between the sensor and MATLAB

COMPARISON WITH OTHER SOLUTIONS



BMW GESTURE RECOGNITION

Abilities

- Able to recognize gestures posed in the general area of the sensor

Limitations

- Does not prevent manual distraction, as user still must remove hand from steering wheel



STEERING WHEEL CONTROL

Abilities

- Able to let user use commands directly on the steering wheel

Limitations

- Does not prevent visual distraction, as the user needs to look and refer to the buttons when pressing them



VOICE CONTROL

Abilities

- Able to control car infotainment system using voice commands
 - Avoid visual and manual distraction

Limitations

- The diversity of human language
- Difficulties in understanding slang and accents
- The environment in car is too noisy for voice recognition



PROJECT DEMO



CONCLUSION



Overall, the project is a success



Able to tackle the issue of distracted driving by introducing gesture recognition and control in car



Stage up till now can accurately detect 6 different static gestures, regardless of the surrounding lighting condition.



Algorithm implemented can filter out non-finger object, hence is not affected by noise.



Limitations include limited gestures and slow response time, which could be improved on in the future