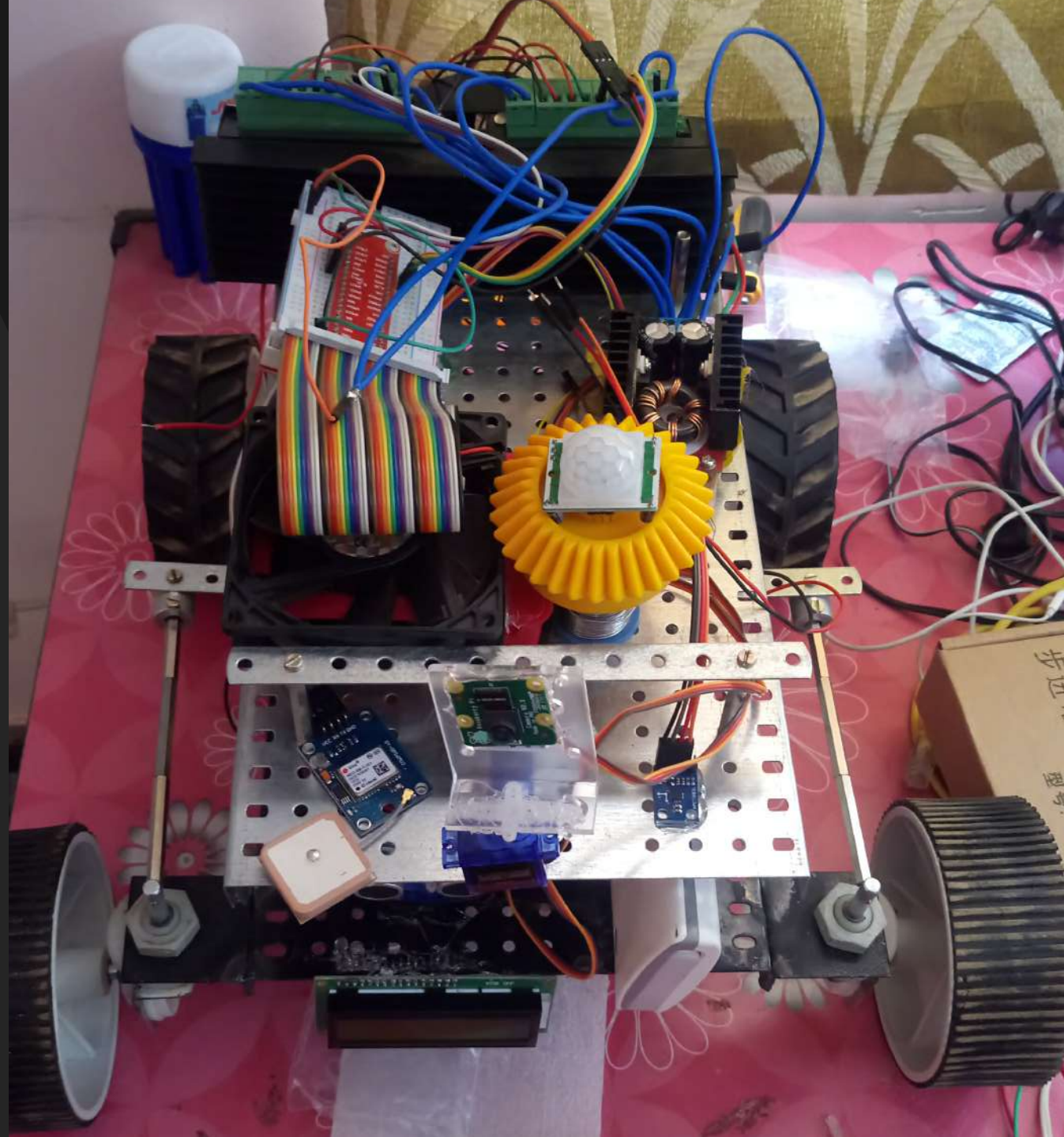
Self Driving Car

Abhinay Raj



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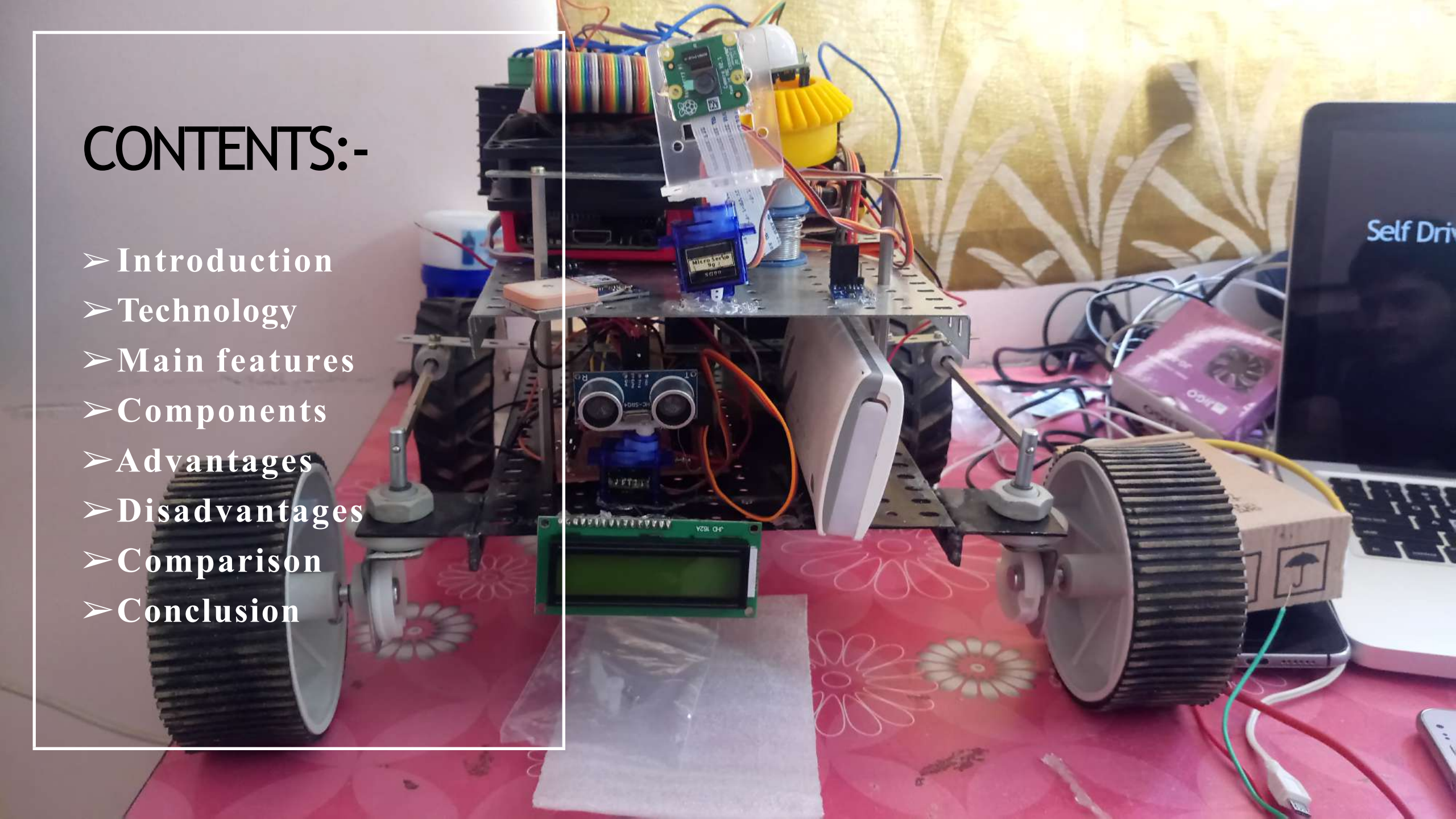
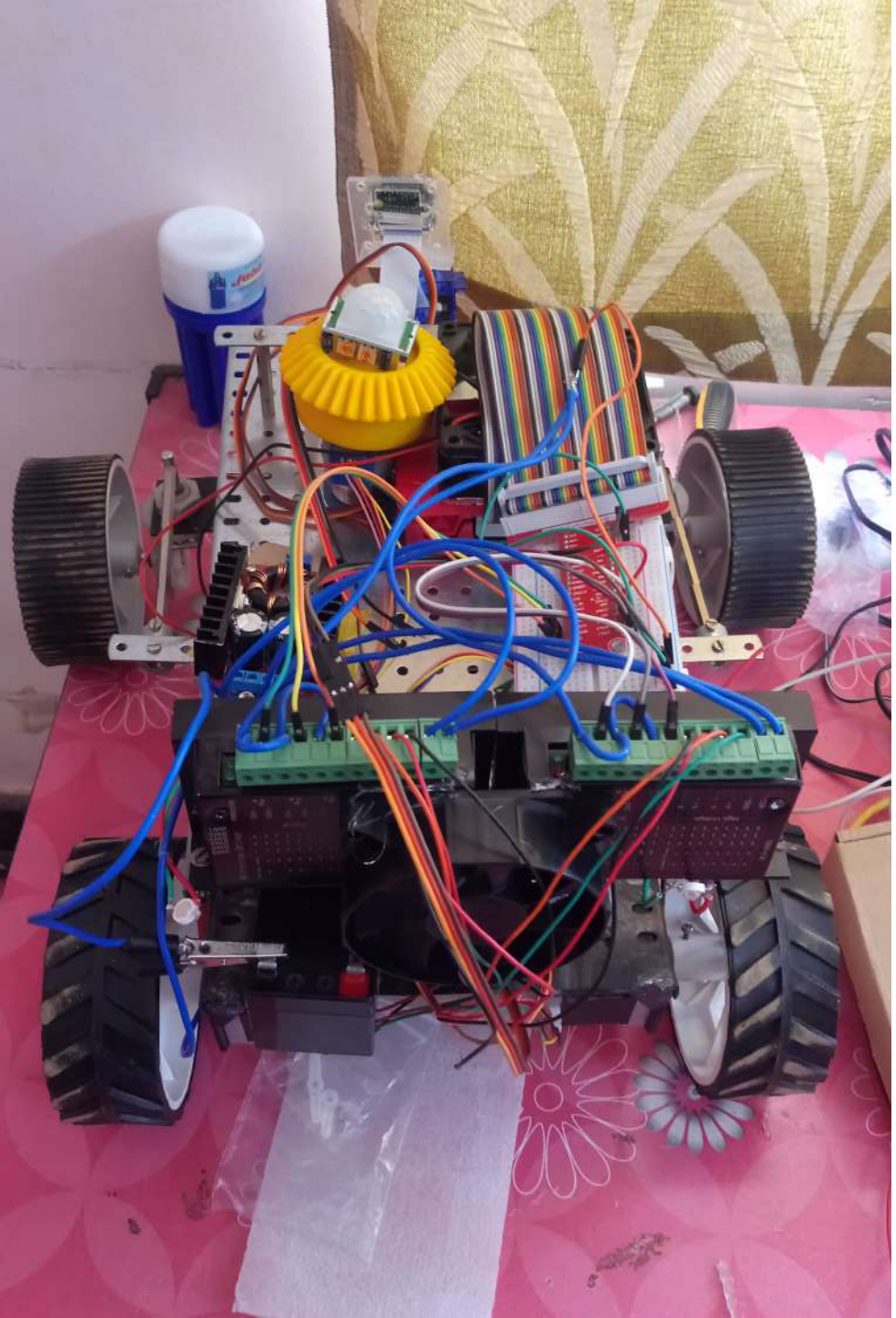


Introduction :-

- An **Autonomous** car(also known as a **driverless car** and a **self-driving car**) is a vehicle that is capable of sensing its environment and navigating without human input.

- Autonomous cars combine a variety of techniques to perceive their surroundings, including radar, laser light, GPS and computer vision. Advanced control systems interpret sensory information to identify appropriate navigation paths, as well as obstacles and relevant signage.



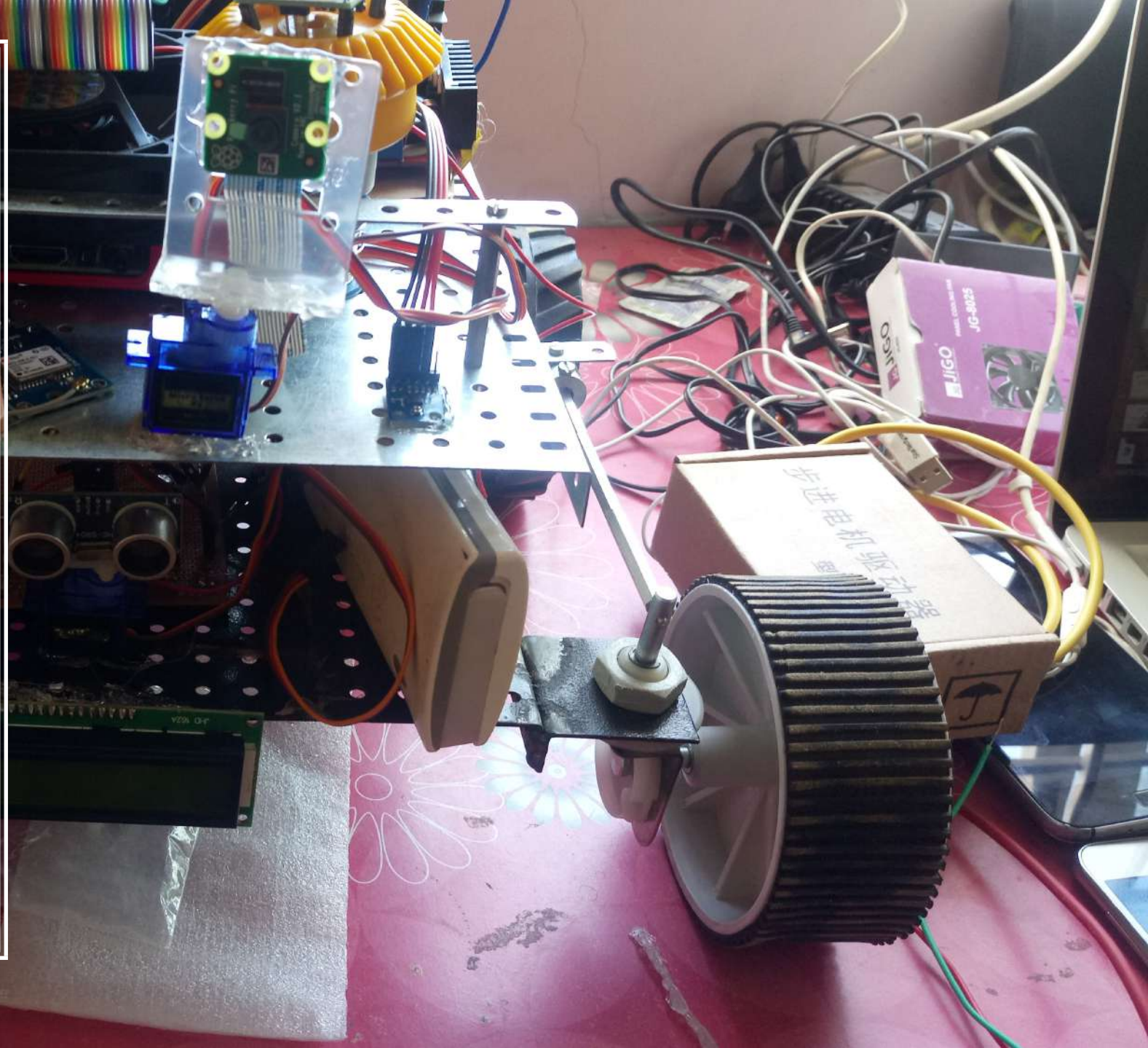
Technology :-

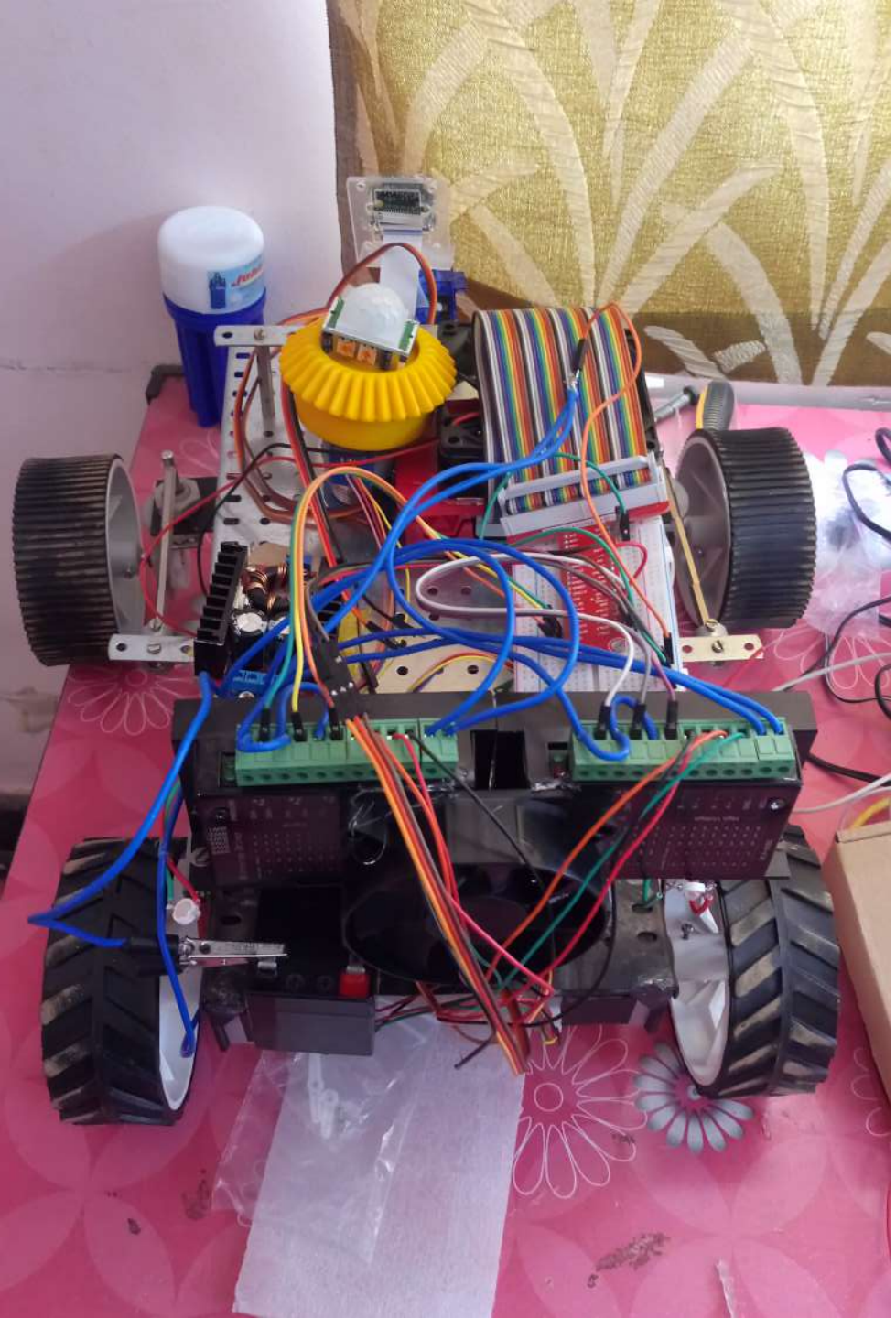
In this Project we are using Fully automation that is 5th level…i.e, ***System capability:*** The driverless car can operate on any road and in any conditions a human driver could negotiate. • ***Human involvement:*** Entering a destination.

Here android app will be used to give the current location and destination location in the search bar, instead of giving destination location user can also insert any *street view image* for the target location or area photo such as any building picture any central mall, hospital, famous monument , university , theatre by the *Human involvement*.

Main Features :-

- Raspberry pi Camera for image processing
- GPS and highly accurate maps
- Two stepper motors for override driving
- Slows down/stops when it detects possible hazards
- One click android App. For booking self driving car.
- App. Needs destination address or just select image of your destination place.





How does it work ?

Self-driving cars have five core components:

- Computer Vision
- Sensor Fusion
- Localization
- Path Planning
- Control

Computer vision is how we use cameras to see the road. Humans demonstrate the power of vision by handling a car with basically just two eyes and a brain. For a self-driving car, we can use camera images to find lane lines, or track other vehicles on the road.

Sensor fusion is how we integrate data from other sensors, like radar and lasers—together with camera data—to build a comprehensive understanding of the vehicle's environment. As good as cameras are, there are certain measurements — like distance or velocity — at which other sensors excel, and other sensors can work better in adverse weather, too. By combining all of our sensor data, we get a richer understanding of the world.

Localization is how we figure out where we are in the world, which is the next step after we understand what the world looks like. We all have cellphones with GPS, so it might seem like we know where we are all the time already. But in fact, GPS is only accurate to within about 1–2 meters. Think about how big 1–2 meters is! If a car were wrong by 1–2 meters, it could be off on the sidewalk hitting things. So we have much more sophisticated mathematical algorithms that help the vehicle localize itself to within 1–2 centimeters.

Path planning is the next step, once we know what the world looks like, and where in it we are. In the path planning phase, we chart a trajectory through the world to get where we want to go. First, we predict what the other vehicles around us will do. Then we decide which maneuver we want to take in response to those vehicles. Finally, we build a trajectory, or path, to execute that maneuver safely and comfortably.

Control is the final step in the pipeline. Once we have the trajectory from our path planning block, the vehicle needs to turn the steering wheel and hit the throttle or the brake, in order to follow that trajectory. If you've ever tried to execute a hard turn at a high speed, you know this can get tricky! Sometimes you have an idea of the path you want the car to follow, but actually getting the car to follow that path requires effort. Race car drivers are phenomenal at this, and computers are getting pretty good at it, too!

Components :-

➢ Google Maps

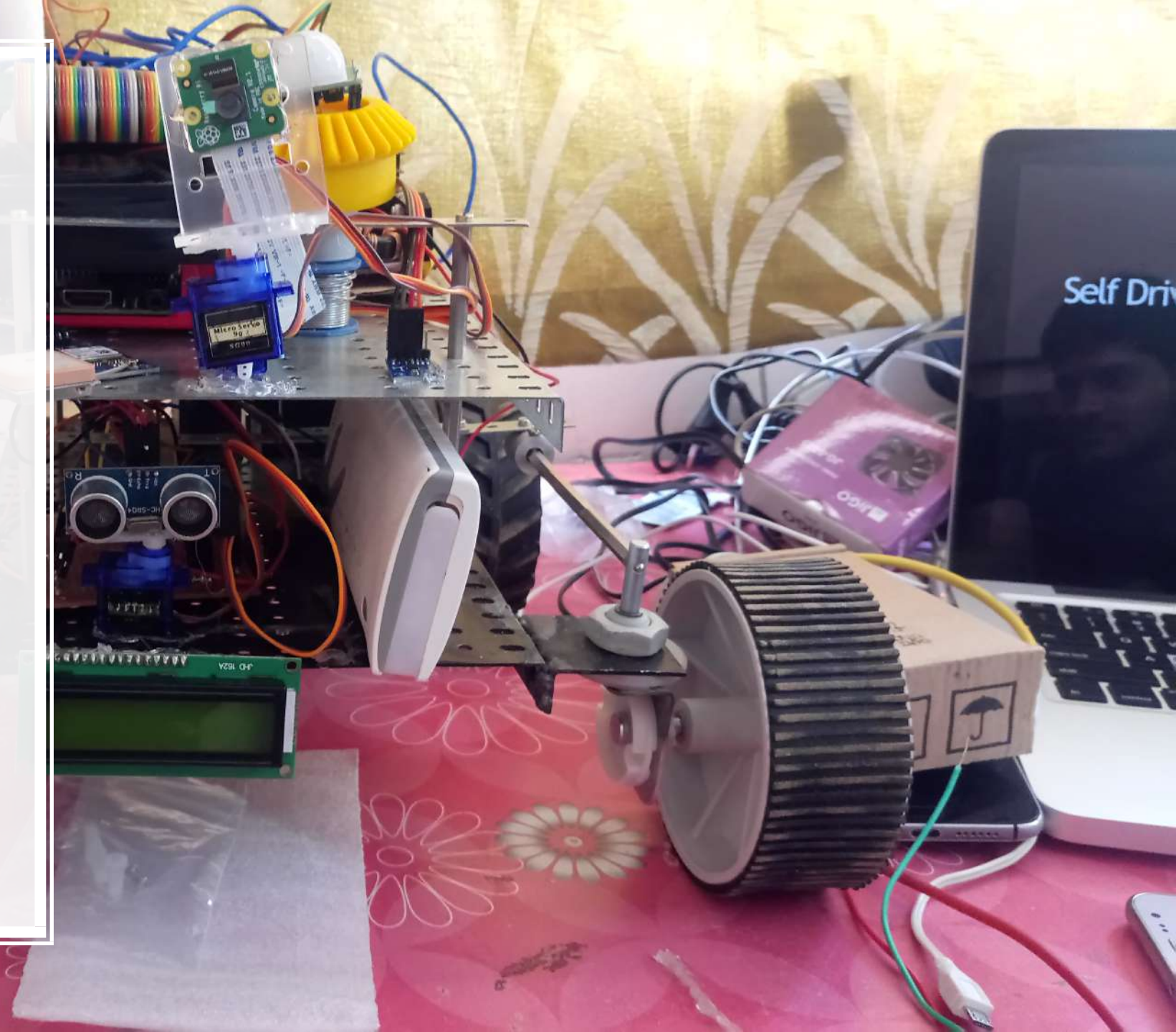
- Provides the car with road information

➢ Hardware Sensors

- Provides the car with real time environment conditions

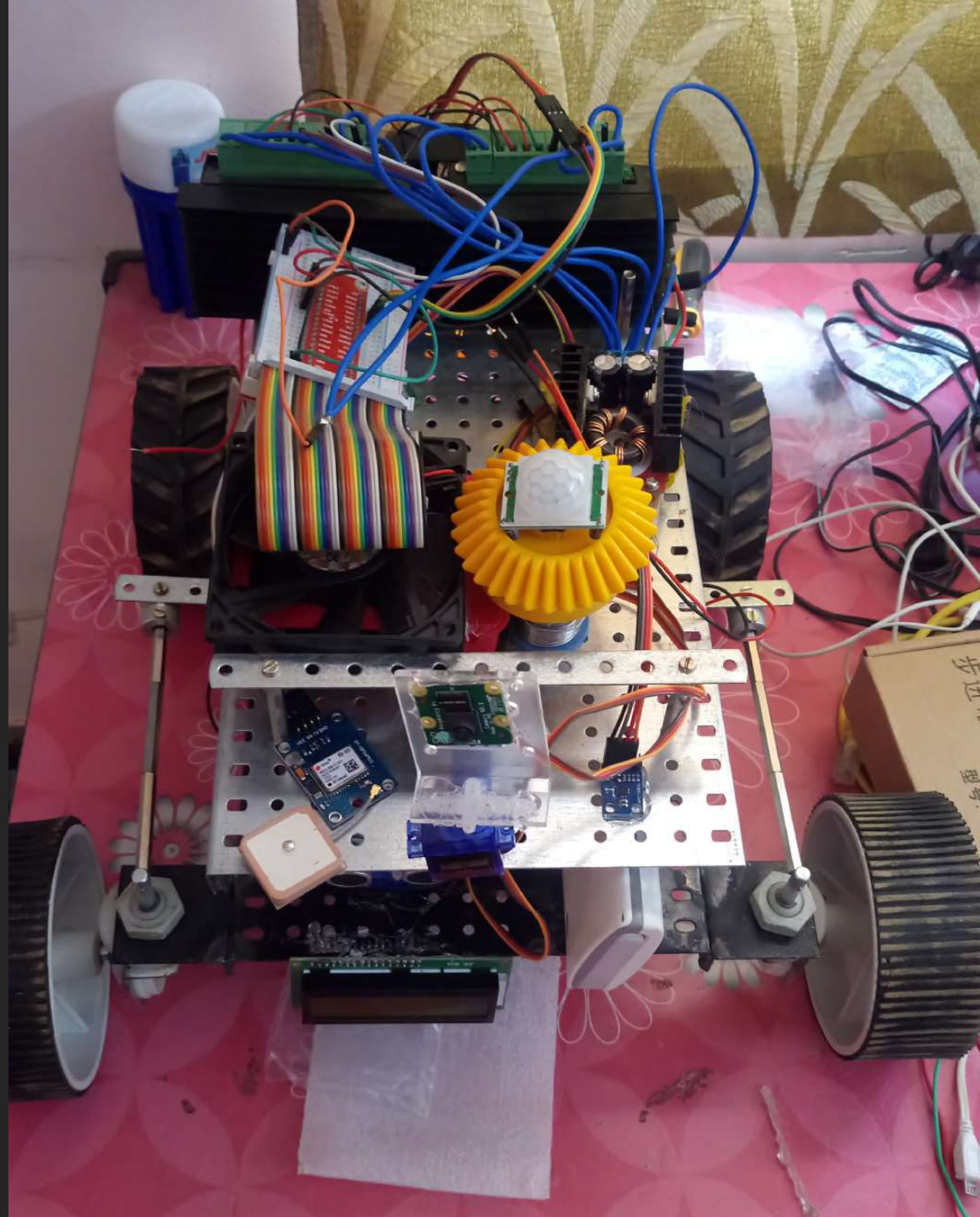
➢ Artificial Intelligence

- Provides the car with real time decisions



1. Google Maps :-

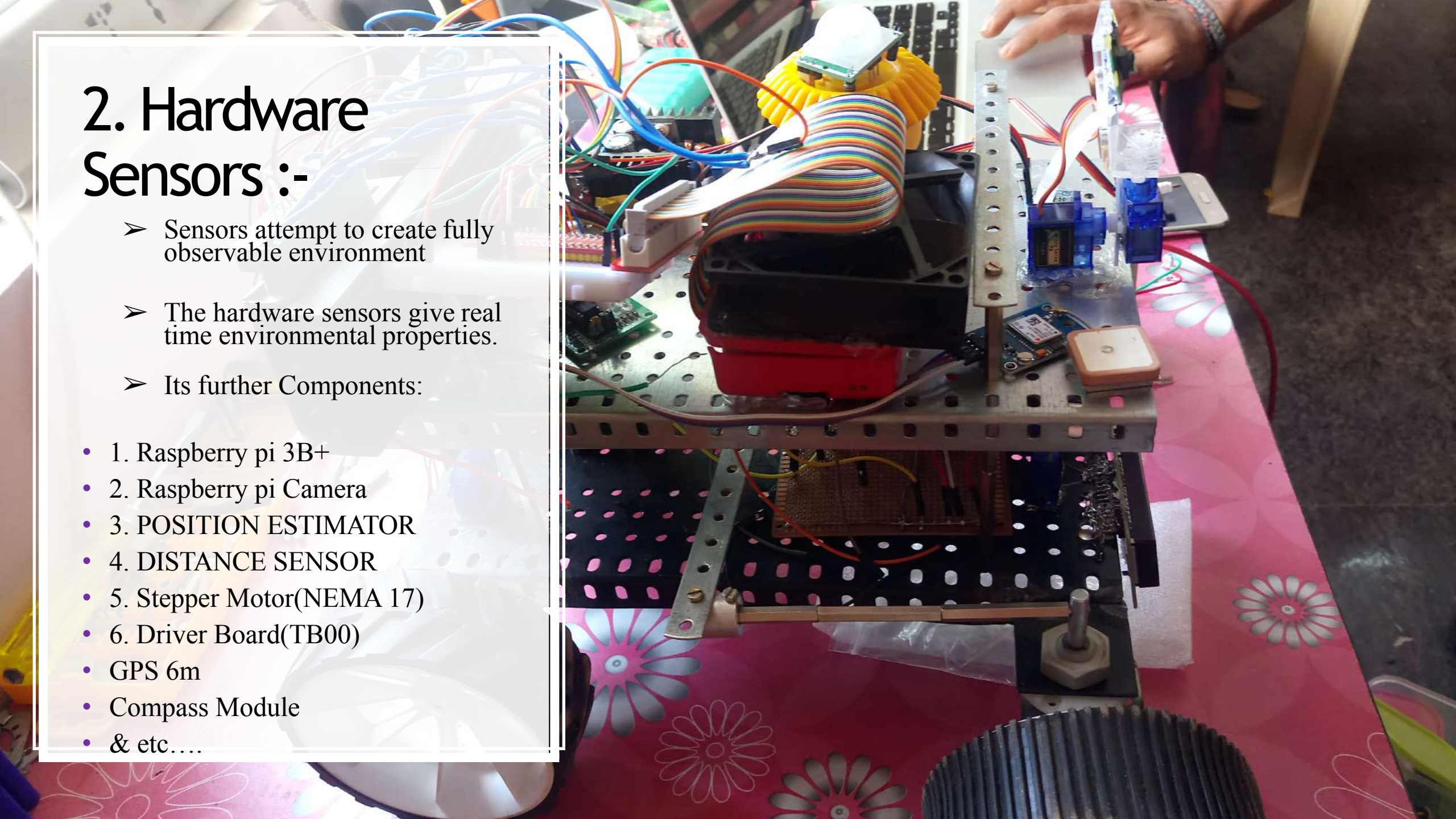
- Google Maps interacts with GPS and acts like a database.
- Speed Limits.
- Upcoming intersections.
- Traffic Report.
- Nearby collisions.
- Directions.



2. Hardware Sensors :-

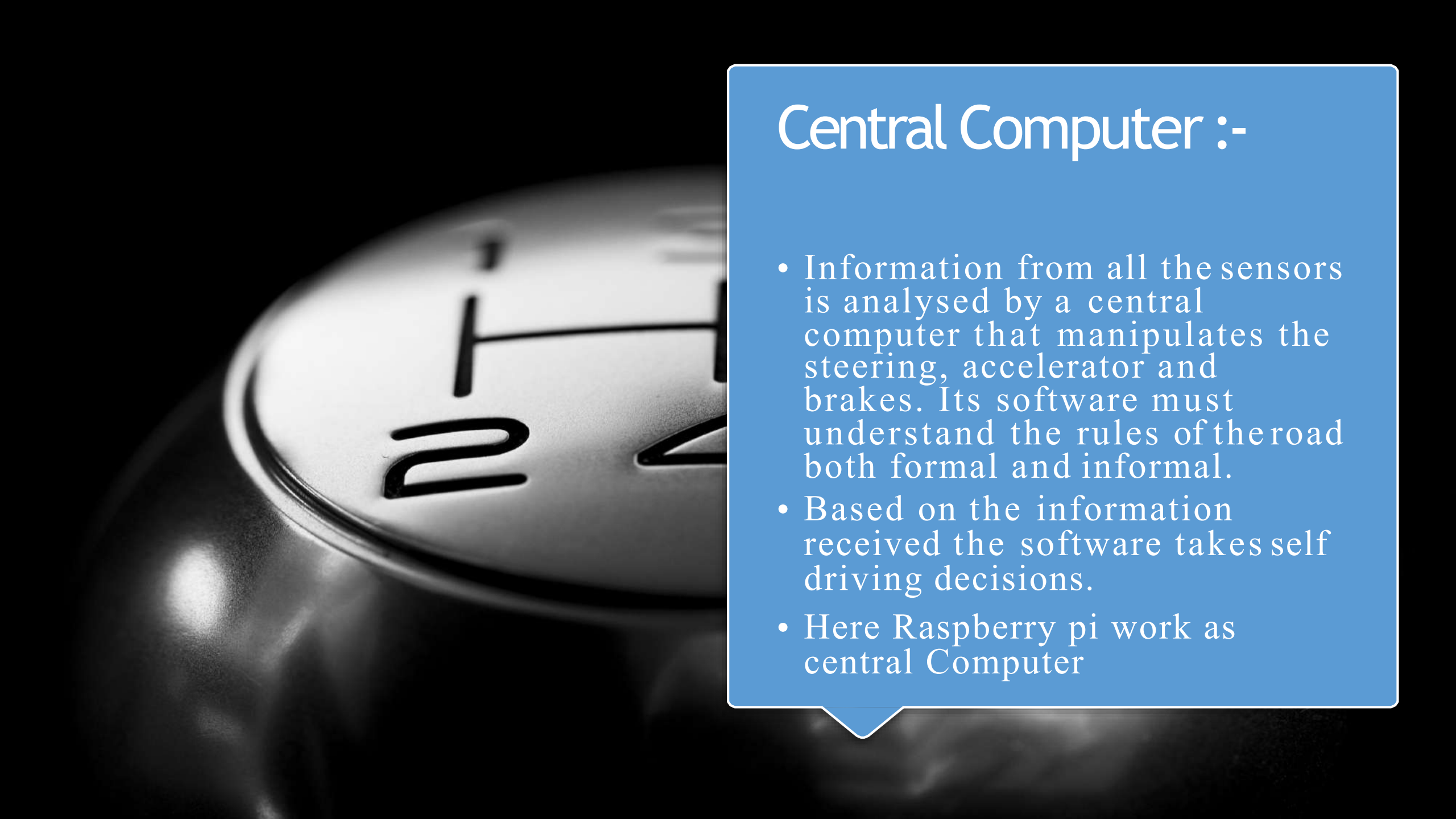
- ➢ Sensors attempt to create fully observable environment
- ➢ The hardware sensors give real time environmental properties.
- ➢ Its further Components:

- 1. Raspberry pi 3B+
- 2. Raspberry pi Camera
- 3. POSITION ESTIMATOR
- 4. DISTANCE SENSOR
- 5. Stepper Motor(NEMA 17)
- 6. Driver Board(TB00)
- GPS 6m
- Compass Module
- & etc….



3.Software :-

- Android App. Made for Booking car, in this I have used android studio with xml and java.
- Raspbian OS on raspberry pi
- Python Script
- Open Cv
- TensorFlow
- NumPy
- Embedded C
- Google Maps
- Firebase Database



Central Computer :-

- Information from all the sensors is analysed by a central computer that manipulates the steering, accelerator and brakes. Its software must understand the rules of the road both formal and informal.
- Based on the information received the software takes self driving decisions.
- Here Raspberry pi work as central Computer

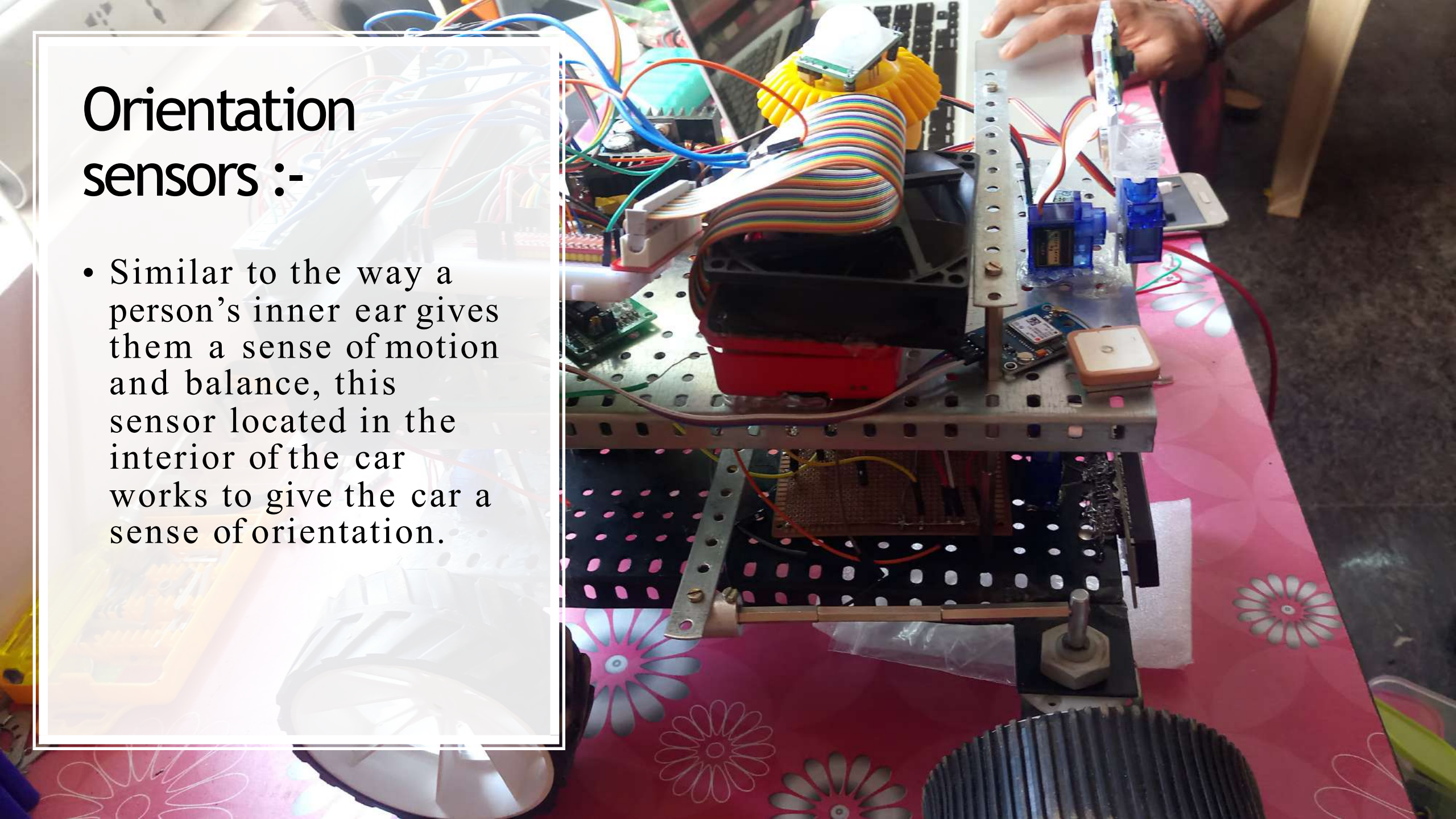
Automotive Night Vision :-

- This system uses a thermographic camera to increase vehicle driver's perception and seeing distance in darkness and poor weather conditions.

- Even those distances which are beyond the reach of vehicle's headlight

Orientation sensors :-

- Similar to the way a person's inner ear gives them a sense of motion and balance, this sensor located in the interior of the car works to give the car a sense of orientation.



4. Artificial Intelligence

- Google Maps and the hardware sensors data are sent to the AI.
- AI then determines:

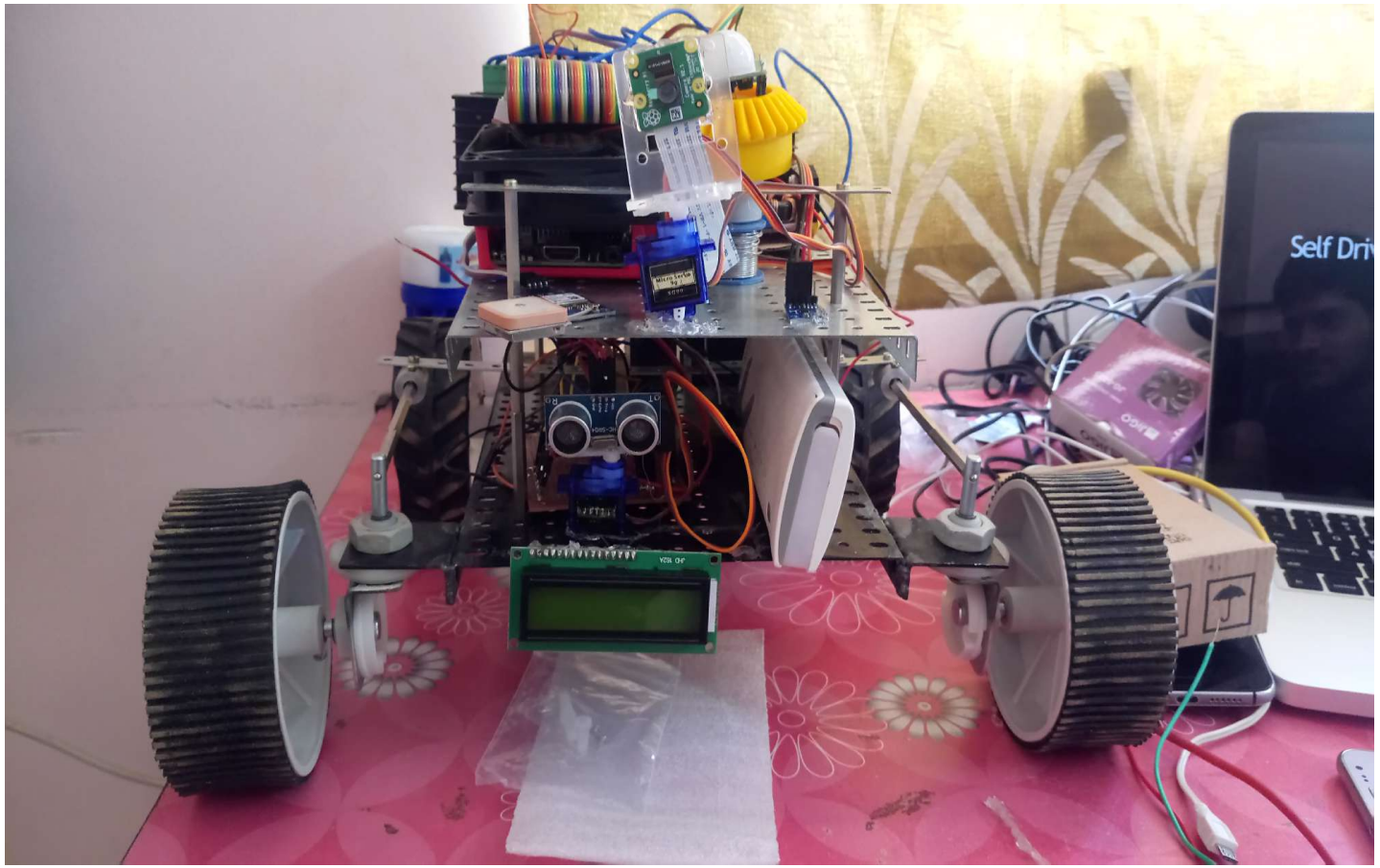
➢ how fast to accelerate
➢ when to slow down/stop
➢ when to steer the wheel

➢ Goal of AI

- The agent's goal is to take the passenger to its desired destination safely and legally

How safe it is?

- The car itself is limited to 25 mph, which restricts it to certain roads, but also minimises the kinetic energy it could carry into a crash if one should happen.
- The front of the car is also made to be as kind to pedestrians as possible with a foam bumper and a flexible windscreen that is designed to absorb energy from an impact with a person's body.



Advantages :-

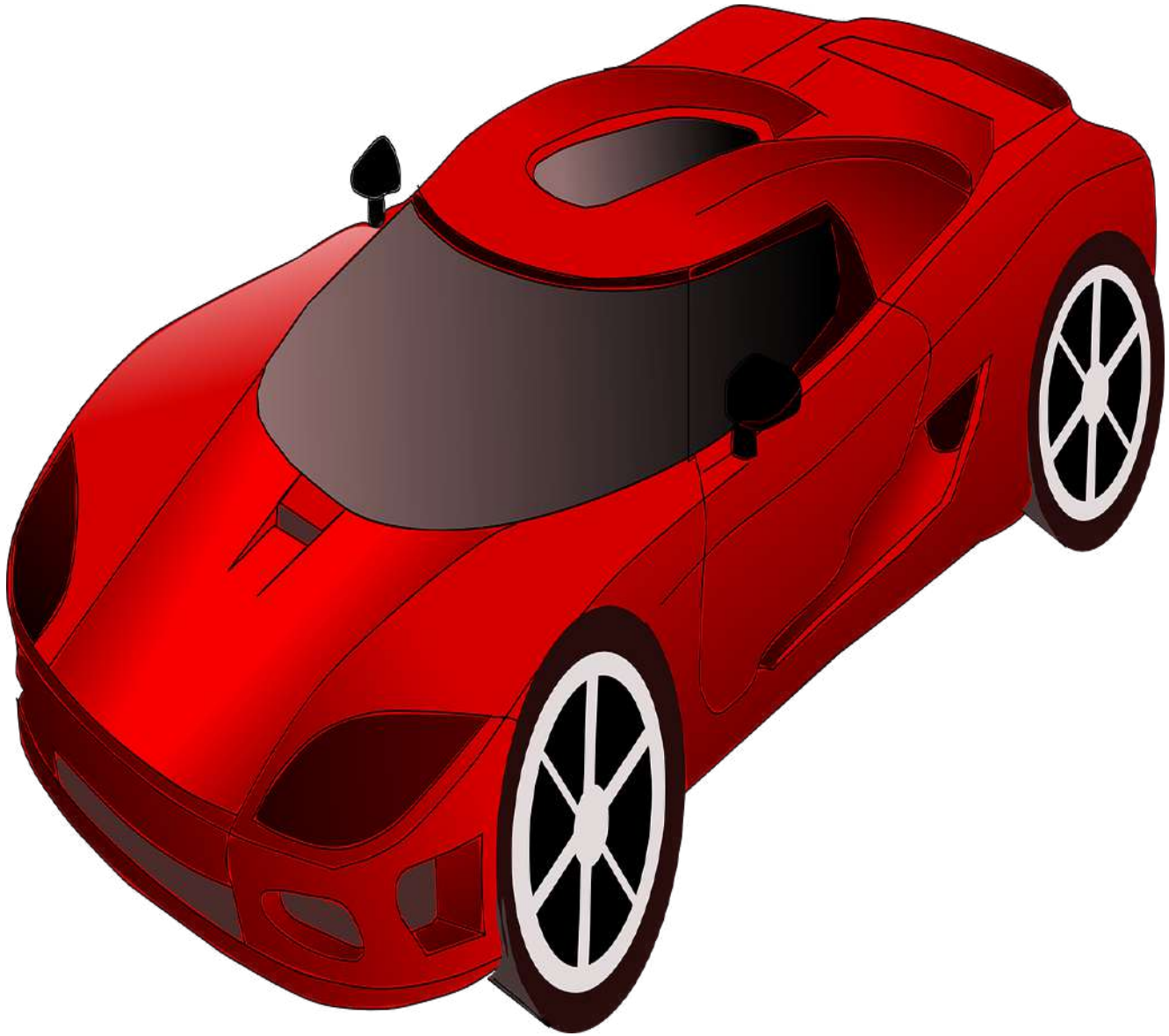
- Avoid accidents.
- Current location can be easily identified by GPS.
- Manage traffic Flow.
- Increasing Roadway capacity.

Disadvantages :-

- If the user is using internet with less security then it can be caught by the hackers.
- Hackers can turn system on or off

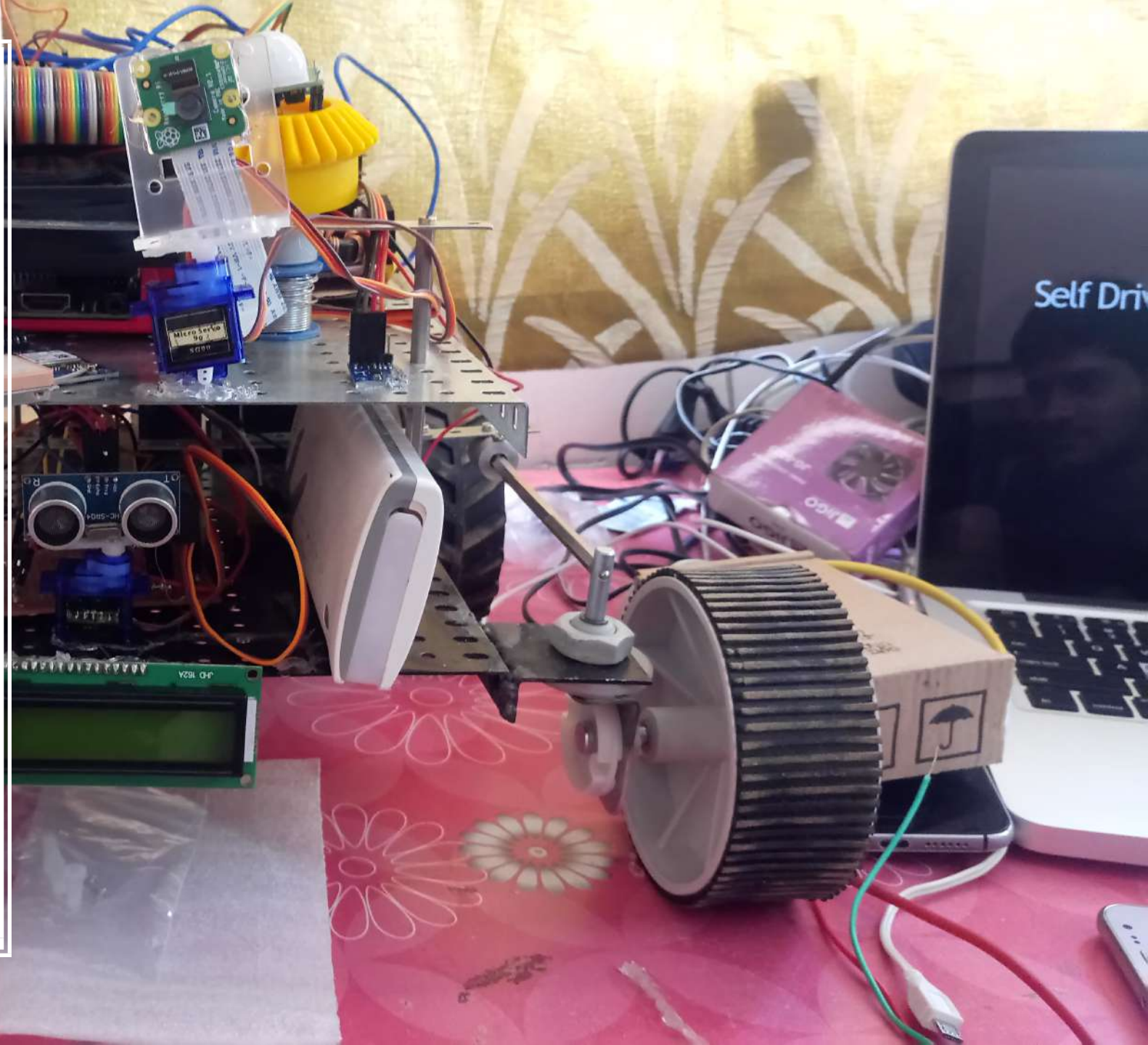
  But it can we drive offline also for particular location.
- In case of failure in main sensor and backup sensor the vehicle can create chances of accidents (but it has capability to take a side of road and stop depends on which sensor failed)

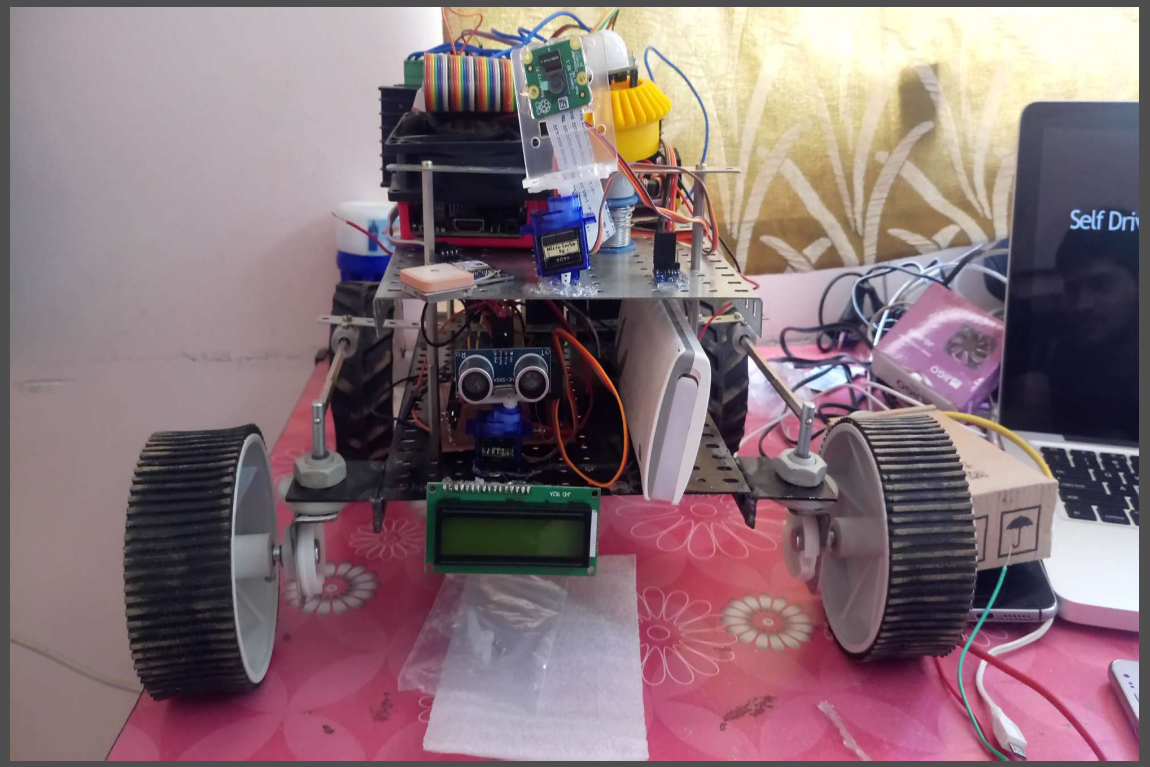
  In case of accident auto dial calling system available and option available for help line to inform others if something happen.



Conclusion :-

- The driverless car’s technologies improve vehicle's stability helps to minimize loss of control.
- Driverless cars are designed to minimize accidents by addressing the main causes of collisions: driving error, distraction and drowsiness.

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