

Vivify trucks

A roadmap by Pratik Mahale

Functions of the kits

- ▶ Easy to install devices to upgrade a Truck
 - ▶ Track the location of the car
 - ▶ Perceive objects around the car
 - ▶ Determine required action
 - ▶ Implement the action using actuators

Parts of completely autonomous vehicle

- ▶ Perception
- ▶ Actuators
- ▶ Control systems

Idea for developing and launching the product

- ▶ Coming up with the whole product would require lot of time and investment
- ▶ This would increase the lead time before launching the product
- ▶ The system can be developed and launched in the market in stages
- ▶ The stages may overlap as the team size increases and different stages are worked in parallel

Stages of Development

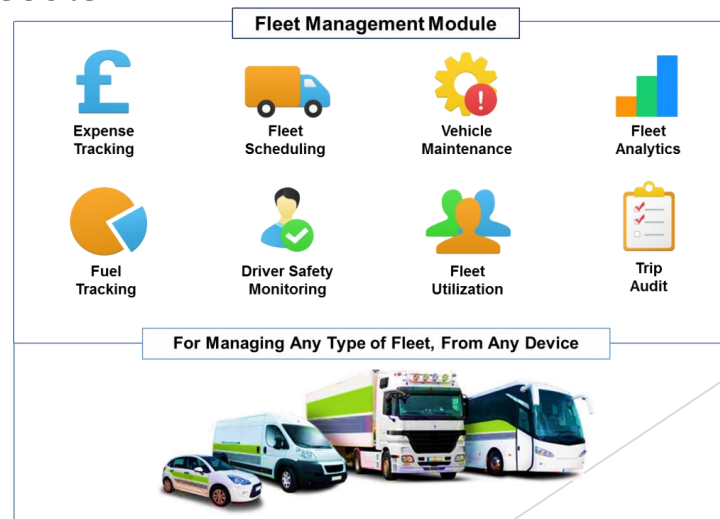
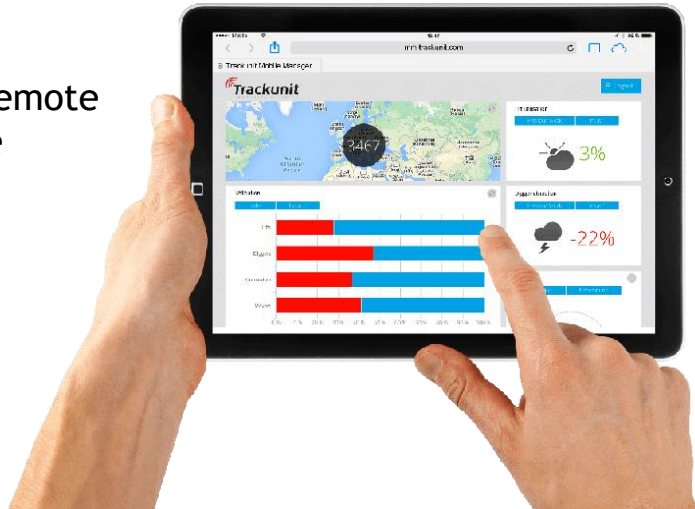
- ▶ Stage 1: Fleet management hardware and software
- ▶ Stage 2: Vision system
- ▶ Stage 3: Remote kits for simple vehicles (golf-carts)
- ▶ Stage 4: Remote kits for Trucks
- ▶ Stage 5: Fully automated simple vehicles
- ▶ Stage 6: Fully automated Trucks

Stage 1: Fleet Management

- ▶ Stage 1.1: GPS system on Trucks to track position and velocity
- ▶ Stage 1.2: Device to track each Truck
- ▶ Stage 1.3: Plan missions and routes
 - ▶ Determine best truck considering capacity, distance, etc.
 - ▶ Determine best path considering multiple pickup and drop locations
 - ▶ Load sharing incase of break down of a truck
 - ▶ Determine best driver considering drivers' schedule

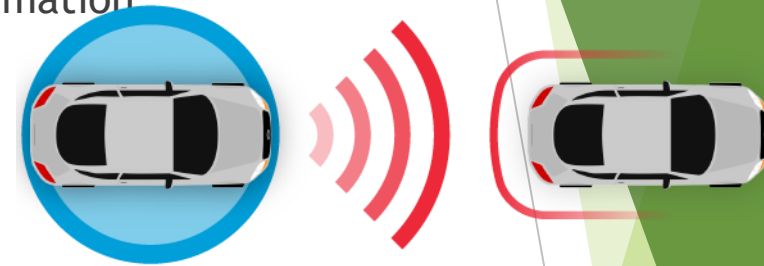


Hand held remote device



Stage 2: Perception/ Vision system

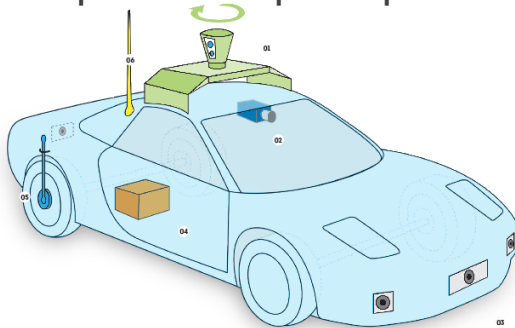
- ▶ Stage 2.1: Proximity sensors for
 - ▶ Queue assistance, collision warning, parking sensors distance information automated braking
- ▶ Stage 2.2: Install simple camera for
 - ▶ Road signs , traffic light and lane detection,
- ▶ Stage 2.3: Introduce object detection and recognition
 - ▶ Pedestrian detection, cross-traffic assistance, blind spot detection
- ▶ Stage 2.4: Introduce LIDAR
 - ▶ Improve the perception



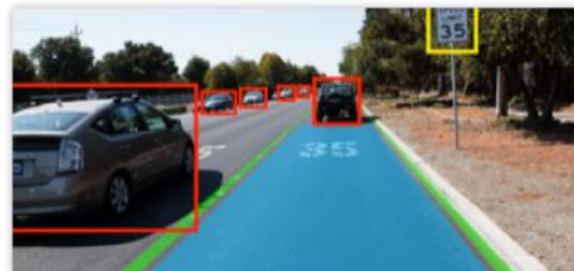
Proximity sensor
Object detection



Camera
Lane detection



LIDAR



Object recognition

Stage 3: Kits for simple vehicles (Remote controlled)

- ▶ Parts of the system:
 - ▶ Inside the car:
 - ▶ Steering control
 - ▶ Throttle control
 - ▶ Brake control
 - ▶ Outside the car:
 - ▶ Add remote control to the device in Stage 1.2



Remote controlled golf cart



Steering Actuator



Brake Actuator

Stage 4: Remote kits for Trucks

- ▶ Introduce the kits for the Trucks



Human operator



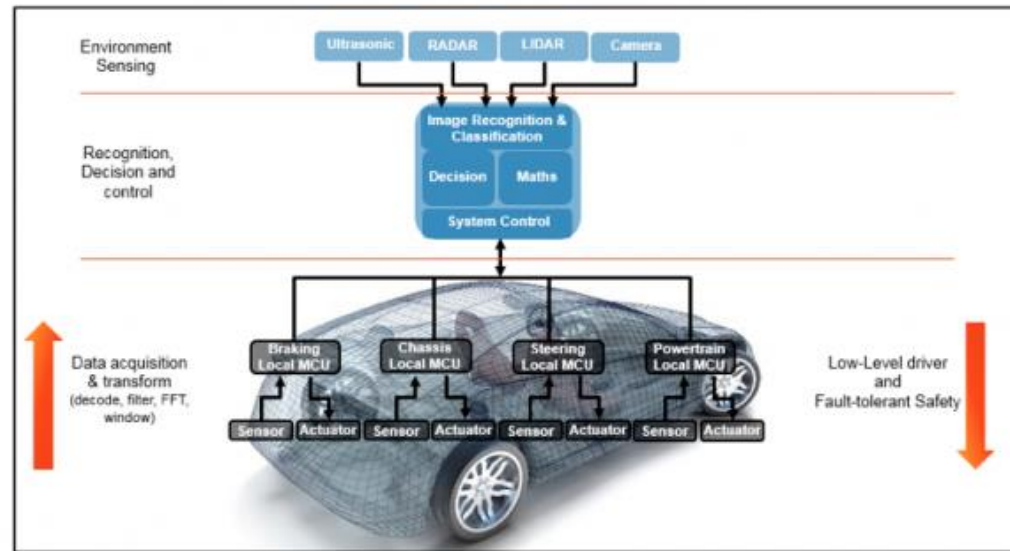
Remote Controlled
Truck

Stage 5: Fully automated simple vehicles

- ▶ Develop controller for the system
- ▶ Integrate the GPS, perception and actuators to complete the kit



Fully automated cart



Integrated system

- This would be a good prototype.
- If all the components are worked on in parallel, it can be achieved sooner.

Stage 5: Fully automated truck

- ▶ Introduce the kit for the Truck to completely automate it.



Fully Autonomous
Truck

Benefit of working in stages

- ▶ Developing the product in stages will help
 - ▶ Generate income
 - ▶ Gaining investor trust by completing realistic intermediate targets
 - ▶ Gaining time to focus on next stages, while previous stages generate revenue
 - ▶ Creating brand name before launching the main heavy investment product