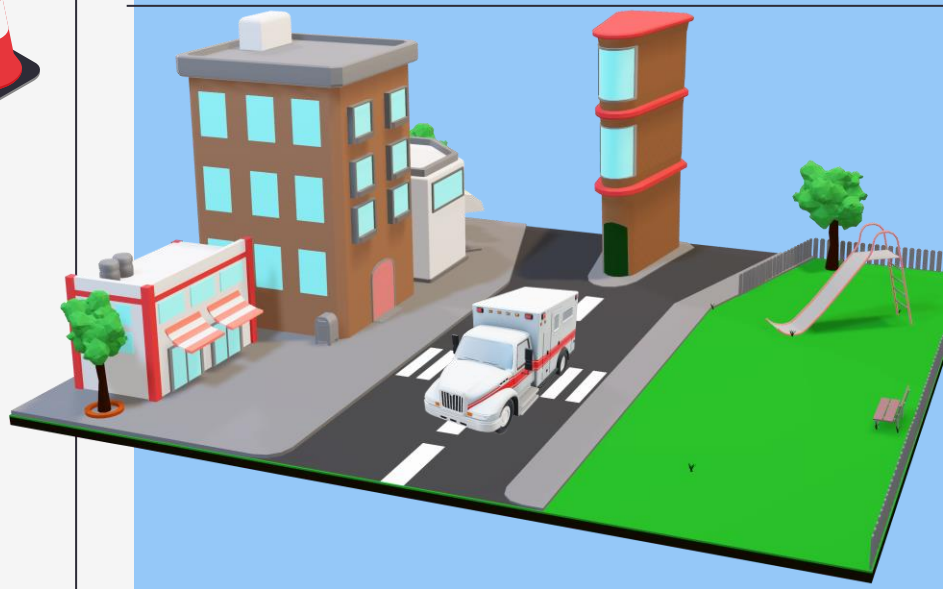
GENIUS TRAFFIC CONTROL SYSTEM FOR AMBULANCE



Presented by-
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01

INRODUCTION

HOSPITAL
HOTEL
Computer Graphic Project
Give Wa
SCHOOL
UNDER

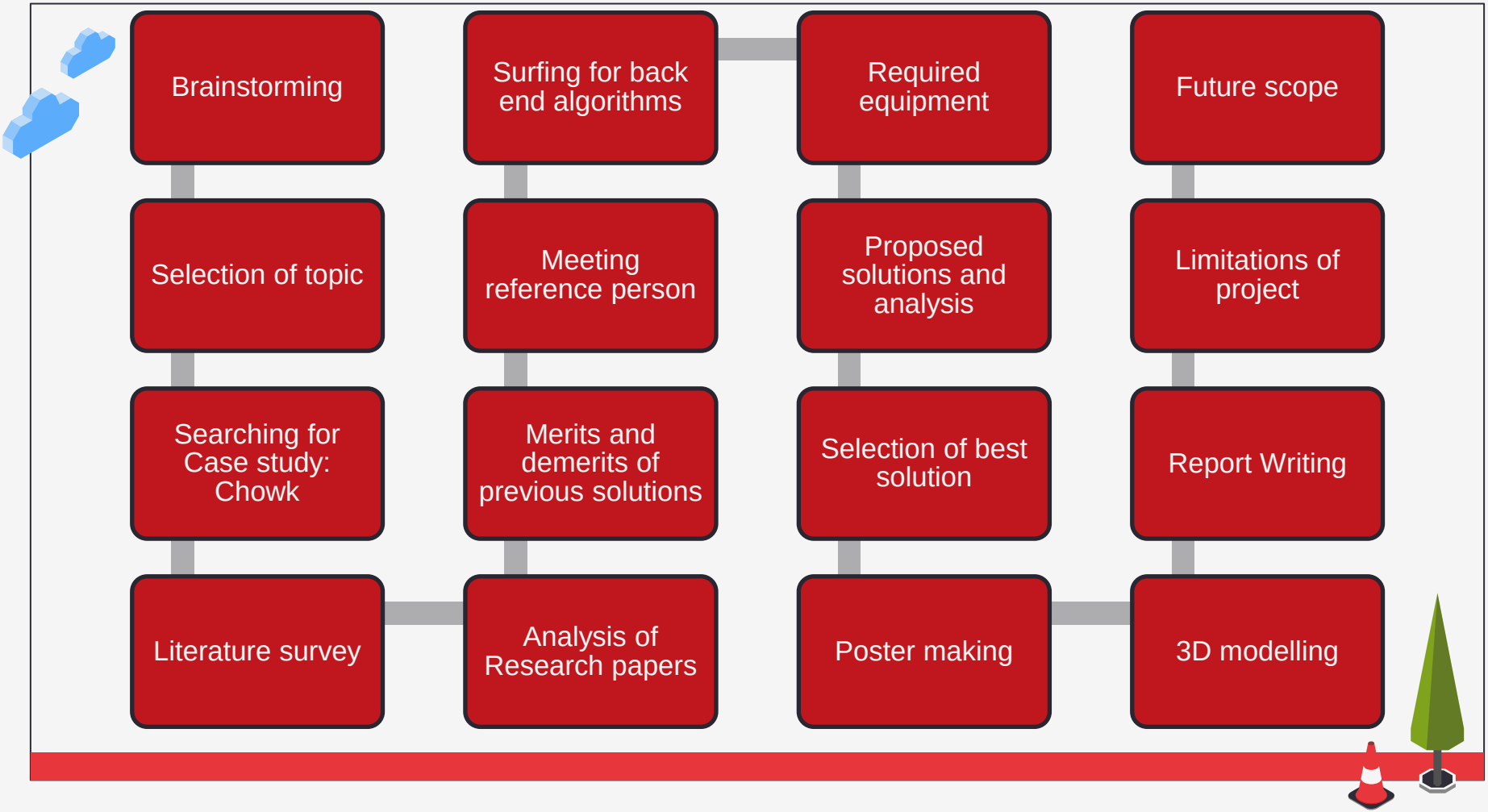
INTRODUCTION

- In India, Ambulances face difficulty in reaching the hospitals due to heavy traffic jams at road junctions.
- Delay in reaching the hospital can result in worsening of the patient's condition.
- Every second counts in medical emergencies.
- **Problem Statement:**

To design a functionality for automatic traffic control system for clearance of vehicle congestion at road junctions in order to create green wave for ambulance during time of emergency.

Objectives

1. To provide genius solution for traffic control using live data (especially for emergency vehicles like ambulance).
2. To understand the technology of radio frequency ID (RFID) and its reader.
3. To upgrade traffic lights with emergency symbol that would be displayed during the time of emergency.
4. To understand and analyze traffic signal control.


Brainstorming
Surfing for back end algorithms
Required equipment
Future scope
Selection of topic
Meeting reference person
Proposed solutions and analysis
Limitations of project
Searching for Case study: Chowk
Merits and demerits of previous solutions
Selection of best solution
Report Writing
Literature survey
Analysis of Research papers
Poster making
3D modelling

02

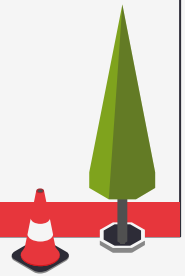
LITERATURE SURVEY

Research Paper : Implementing Intelligent Control System for congestion control, ambulance clearance and stolen vehicle detection

- Research paper divided into 3 parts

a) Automatic signal control
b) Emergency vehicle clearance
c) Stolen vehicle

- Important components: ZigBee Module, Microcontroller, GSM module, RFID reader



Research Paper : Implementing Intelligent Control System for congestion control, ambulance clearance and stolen vehicle detection

- **Demerits observed:**

a. Data processing is complex
b. Congestion analysis not taken continuously hence not accurate
c. GSM process time is low
d. Vague solution cannot be implemented in all scenarios

Research Paper: RFID and GPS based automatic lane clearance system for ambulance

- **Features**

a. When an RFID card is swiped near the RFID reader the GPS coordinate transmission is activated. GPS receiver and transceiver interfaced with Arduino microcontroller continuously receives the GPS co-ordinates of the ambulance.

b. This system establishes communication between the ambulance and Traffic signal post by using transceivers and Global Positioning System (GPS).

Research Paper: RFID and GPS based automatic lane clearance system for ambulance

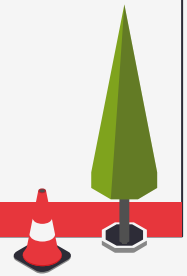
c. This system for ambulance control is fully automated. It includes two units:

i. Ambulance unit:

- It is installed in ambulance.
- Components in ambulance unit: Microcontroller (Arduino uno), GPS receiver, Transceiver (Xbee S2), RFID reader (EM-18)

ii. Junction unit:

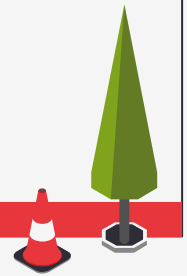
- Installed at traffic post.



Research Paper: RFID and GPS based automatic lane clearance system for ambulance

- **Demerits observed:**

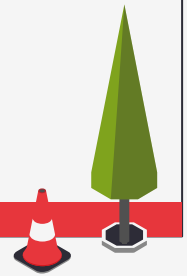
a) Each traffic light needs to be programmed individually in order to note down matching coordinates for controlling traffic light of junction.
b) Delay due to GPS transmission.
c) Live coordinates of other vehicles for congestion are not considered for controlling traffic lights.
d) Implementation of this system is difficult for govt. ambulances.



Research Paper: Sensor based Traffic control System

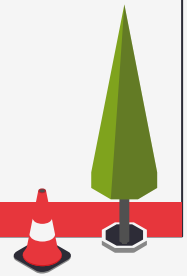
- **Features:**

1. It has two separate control system: • One which collects vehicle density (data) on the industrial lanes using ultrasonic sensors. • Then it uses this data in order to control traffic lights.
2. Components used in this system: Ultrasonic sensor (HC-SR04), Transceiver module (NRF24101).



Research Paper: Sensor based Traffic control System

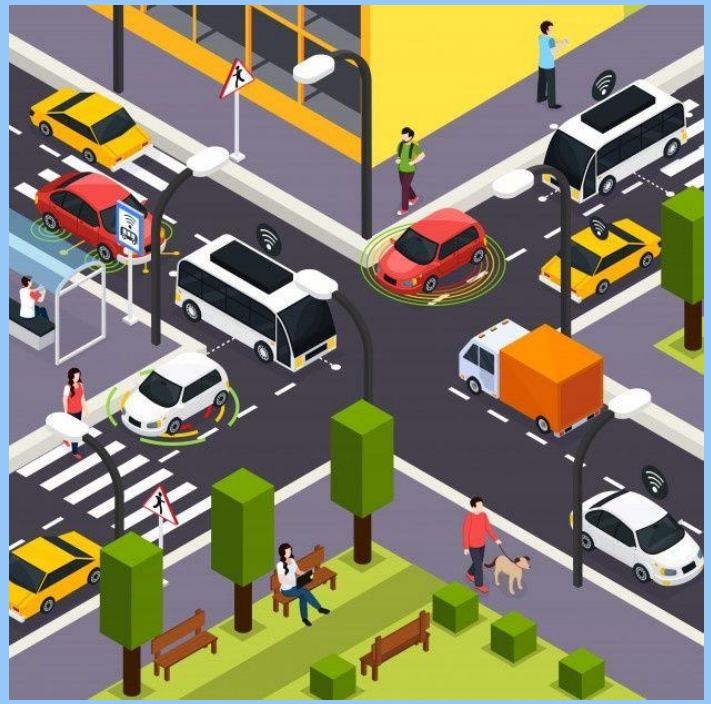
3. This system avoids vehicle lining up on one side of the lane as ultrasonic sensors are placed at either side of the lane.
4. This is used to better value the gauge density. It gives priority to the lane with maximum traffic (else lane with emergency vehicle).
5. Arduino mega is used to power the LEDs and Arduino board powers through solar energy /electricity.



Research Paper: Sensor based Traffic control System

- **Demerits observed:**

1. Ultrasonic sensors have a limited range of detection compared to other sensor types like radar.
2. The transceiver module (NRF24L01) requires careful configuration and management.
3. Transceiver module (NRF24L01) has complex configuration and can consume relatively high-power during transmission.



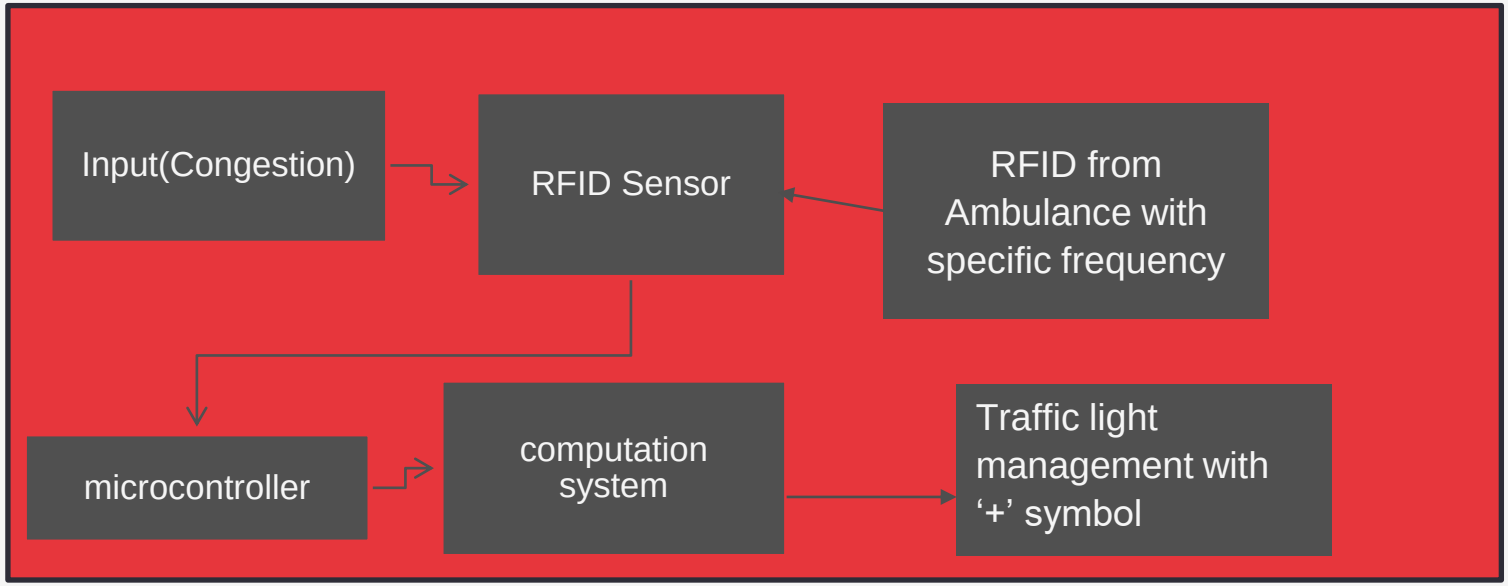
03

PROPOSED MODELS

01
RFID TAG AND READER

- **INTRODUCTION**
- Makes use of RFID tag, RFID sensor, Microcontroller, ZigBee module.
- Tags are fixed on each vehicle and special tags on ambulance.
- Readers are attached on road, sideway railings or added infrastructure according to necessity.
- A warning symbol will be displayed in advance for other vehicles crossing at the junction

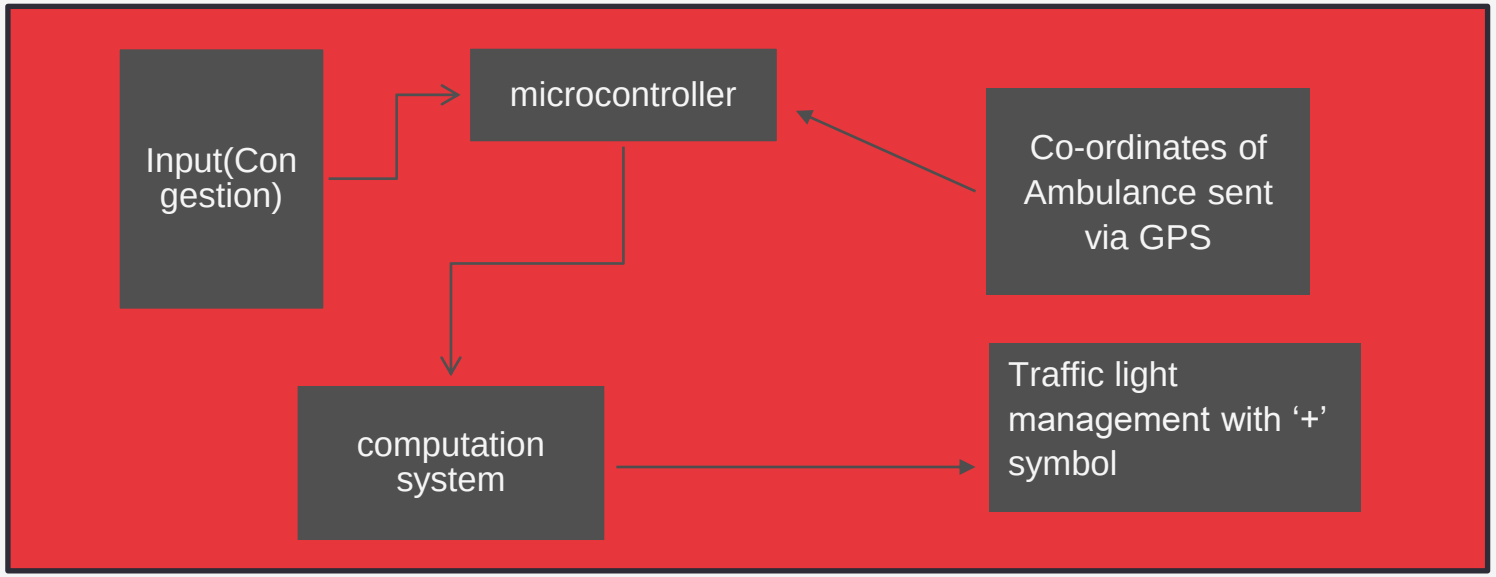
Flowchart


Input(Congestion)
RFID Sensor
RFID from Ambulance with specific frequency
microcontroller
computation system
Traffic light management with '+' symbol

02
GPS CO-ORDINATES

- **INTRODUCTION**
- This solution makes use of ZigBee module interfaced with GPS co-ordinates of Ambulance.
- Live location of ambulance is tracked.
- Emergency symbol is reflected when ambulance comes at pre-specified co-ordinates.
- Live congestion cannot be acquired since locating GPS of each vehicle is impractical. So previous data sheet is required to manage traffic lights.

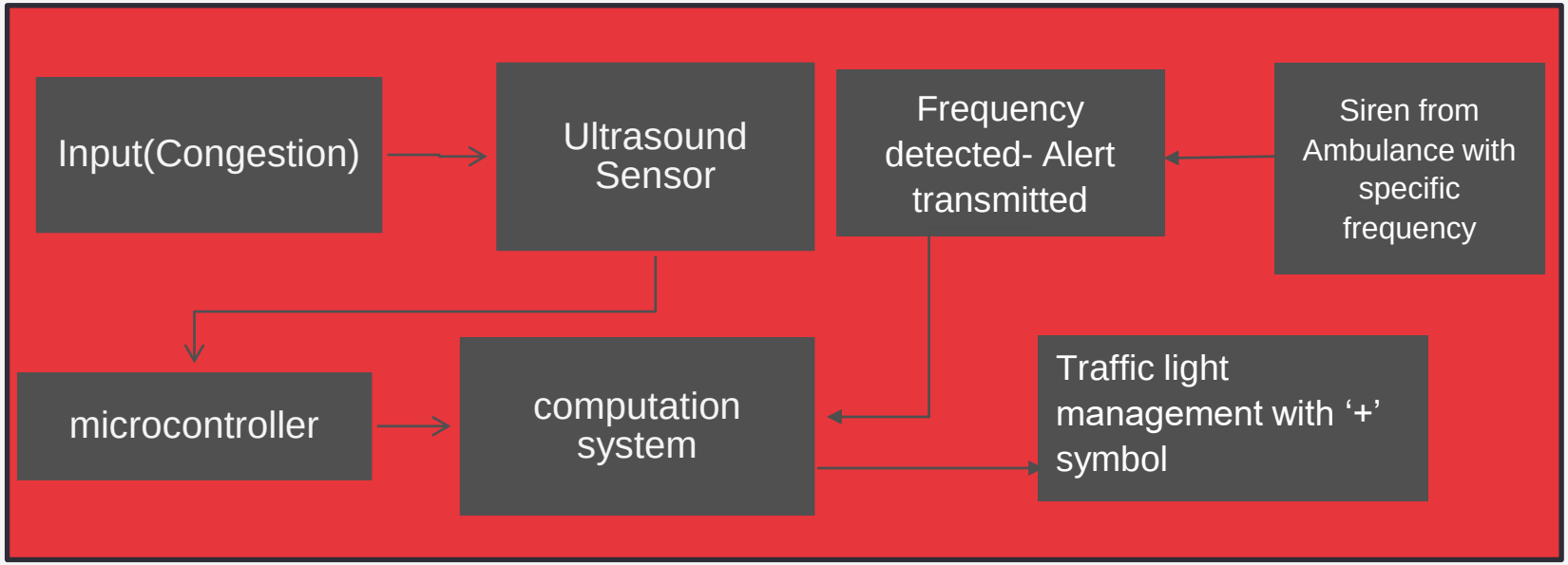
Flowchart


Input(Congestion)
microcontroller
Co-ordinates of Ambulance sent via GPS
computation system
Traffic light management with ‘+’ symbol

03
SIREN SOUND FREQUENCY

- **INTRODUCTION**
- Siren frequency of ambulance is detected by ultrasound sensors at road junctions.
- Sensors interfaced with microcontroller.
- Microcontroller manages traffic lights (Reflects emergency symbol for warning other vehicles crossing the road).
- Live congestion cannot be acquired since locating GPS of each vehicle is impractical. So previous data sheet is required to manage traffic lights.

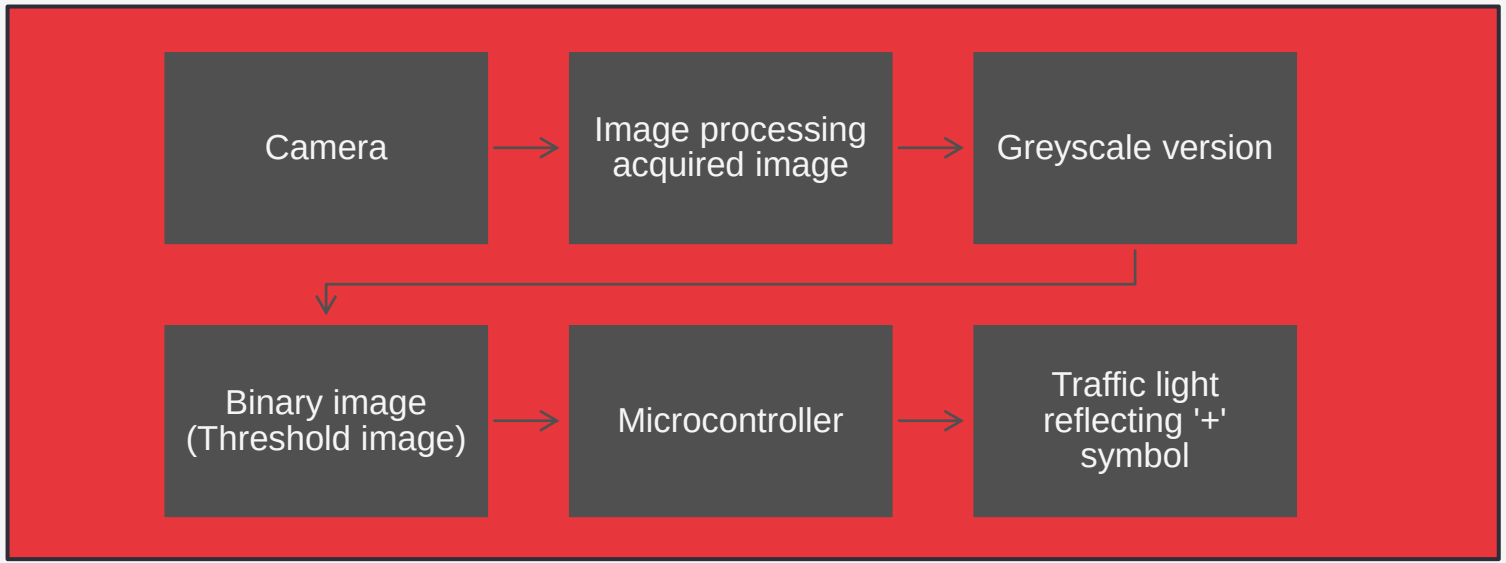
Flowchart

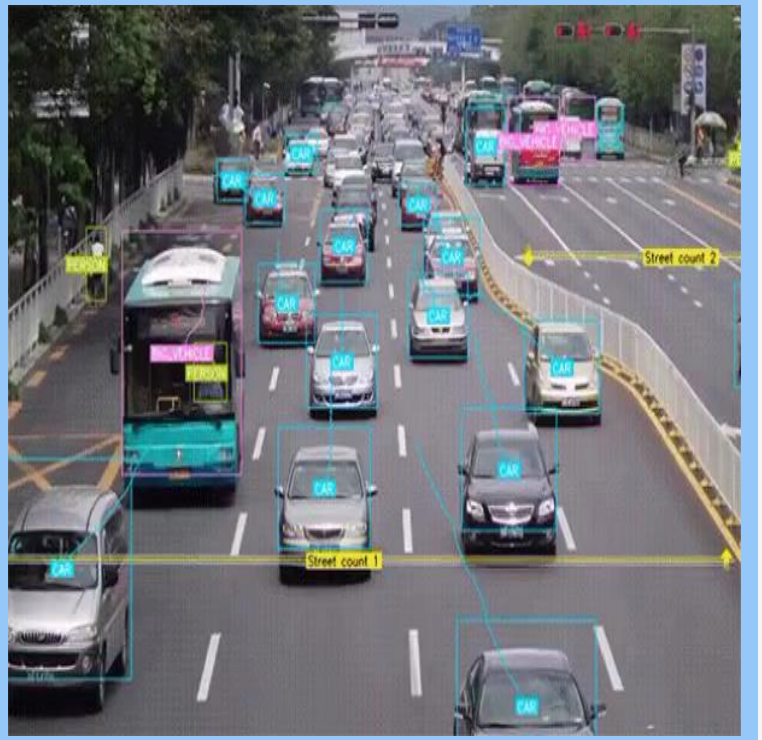

Input(Congestion)
Ultrasound Sensor
Frequency detected- Alert transmitted
Siren from Ambulance with specific frequency
microcontroller
computation system
Traffic light management with ‘+’ symbol

04
IMAGE PROCESSING THROUGH WEBCAM

- **INTRODUCTION**
  - Uses webcam to record images of vehicles.
  - Converts them to greyscale for easy working of algorithm.
  - Sends the acquired information to controller for management of traffic lights.

Flowchart


Camera
Image processing acquired image
Greyscale version
Binary image (Threshold image)
Microcontroller
Traffic light reflecting '+' symbol



04

WORKING MODEL

RFID TAG AND READER

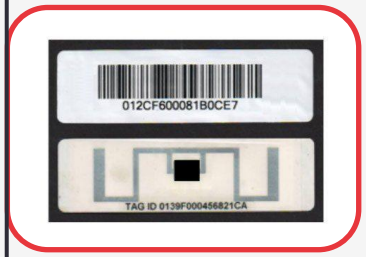
INTRODUCTION

"Genius traffic control system for ambulance" model aims to create a GREEN WAVE for an emergency vehicle like ambulance by clearing the congestion at a junction before the ambulance reaches the junction.

The model comprises of components as follows:

1. RFID (Radio Frequency Identification) Tag:
   - Type-Passive
   - Frequency-300 MHz to 3GHz
2. RFID (Radio Frequency Identification) reader: EM 18 (Range-9m)
3. ZigBee Module
4. Micro-controller: Arduino Uno

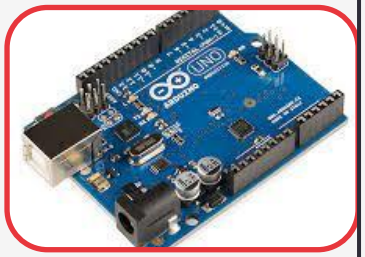
EQUIPMENT REQUIRED



RFID tag

RFID reader

Zigbee module

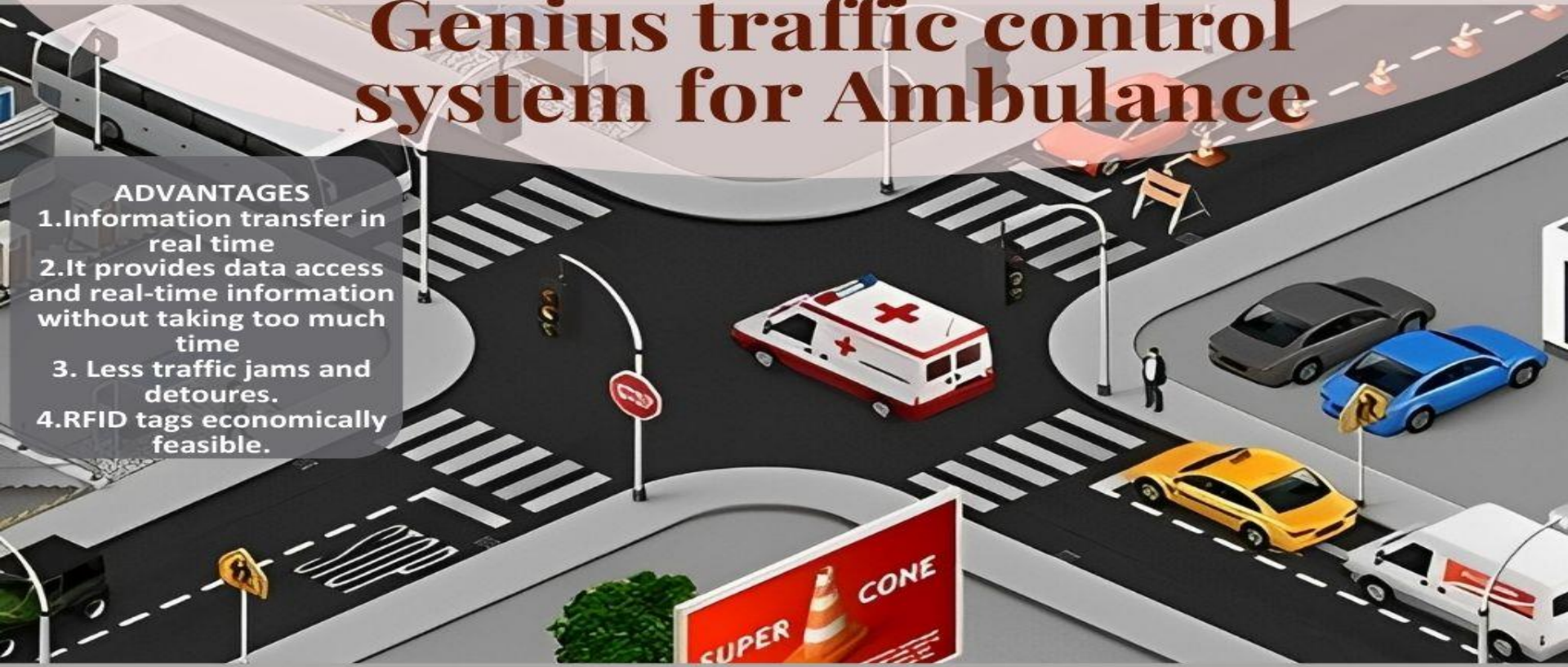


Microcontroller

FEATURES OF THE MODEL

- RFID tags on vehicles for detection
- RFID Sensors more in number than previous models
- Live data collected and analysed for congestion
- Plus ‘+’ symbol will be reflected for a specific time on traffic signal for warning of emergency vehicles
- Continuously data is fetched, analysed and transmitted
- Provides red light management and control

Genius traffic control system for Ambulance



ADVANTAGES

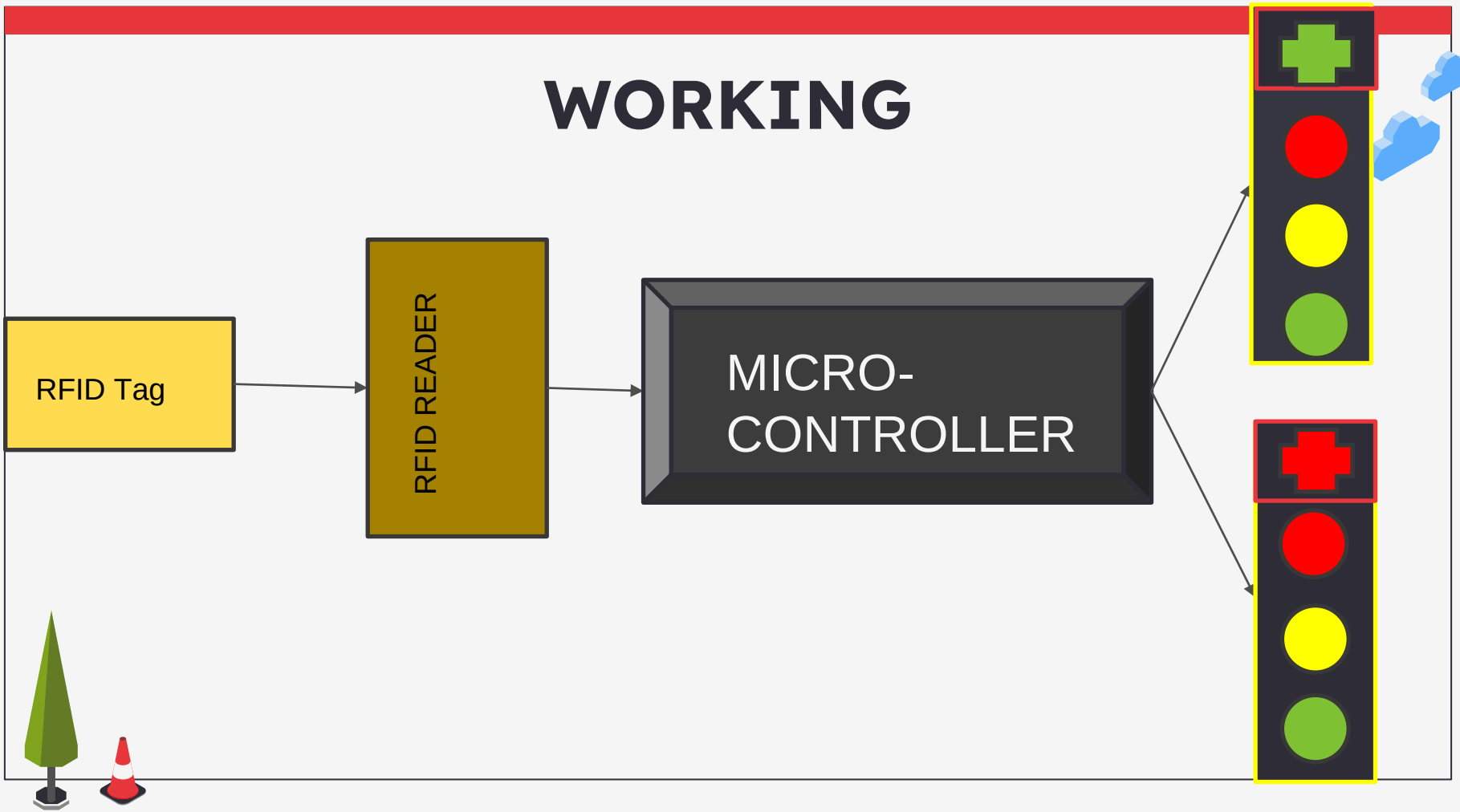
1.Information transfer in real time
2.It provides data access and real-time information without taking too much time
3. Less traffic jams and detoures.
4.RFID tags economically feasible.

RFID reader :
Reads the RFID tag attached to vehicles & that vehicle data is added to database.

RFID tag :
1. Fixed on vehicle
2.Special tag for ambulance

Microcontroller :
Fetches data from RFID reader and co-ordinates the traffic lights

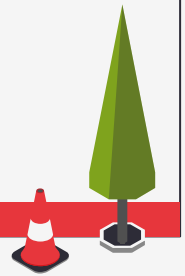
WORKING



Solutions based on location of reader

- Based on the location of reader there could be 3 possible ways to implement this solution:

1. On side-ways of Road
2. On an overbridge
3. On road



Proposed Model 1 : On side ways

Cost – Rs. 6500-11000

Pros :
1. Estimation of traffic more accurate.
2. The RFID system is non-line of sight nature of the technology.

Cons :
1. Infrastructure not practical (number of readers)

Proposed Model 2 : Over bridge

Cost – Rs. 5500-9000

Pros :
1. No damage to RFID reader

Cons :
1. Infrastructure complex
2. Economically not feasible

Proposed Model 3 : On road

Cost – Rs.5500-8500

Pros :
1.No extra infrastructure required.

Cons :
1.Sensors can be damaged.

3D MODEL OF SOLUTION

https://app.sketchup.com/share/tc/asia/xJK41gDEjjo?stoken=IrVvRWPMMG-6U_AvZt3iYYb1_Txme_XDqvN9vhr7w9dafxYSa6w3E8lPhMCGHLl-&source=web

COSTING

- Reader:- Rs.300-600
- Tag
  - Metallic – sideways:- Rs. 50-60
  - Windshield tag – overbridge:- Rs. 300-500
  - On metal rivet, Flexi – on road:-Rs. 50-60
- Zigbee module – 2000-3000
- Microcontroller -2000-3000

Research paper for control algorithms

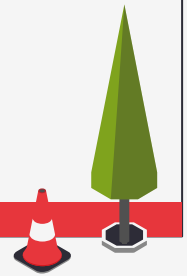
Discussed Parameters:

- Width of road
- Number of vehicles passing through the sensor per unit time
- Vehicle length
- Distance of ambulance from the traffic signal
- Speed of ambulance
- Level of the route (Heavy traffic, moderately busy, least considered)

Research paper for control algorithms

The algorithms which can be used for the efficient co-ordination of the traffic signals are:

- Control of Networks by Optimization of Switchover (CRONOS)
- Artificial Fish Swarm Algorithm (AFSA)
- Ant Colony Algorithm
- Fuzzy Logic based Traffic Intensity Calculation Function
- YOLO Model
- Intersection over union (IOU) process

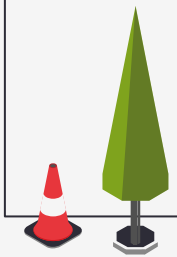


05

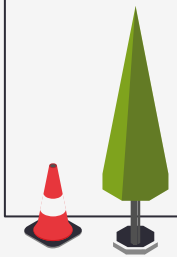
CONCLUSION

LIMITATIONS AND FUTURE SCOPE

- **Limitations:**
  1. Additional infrastructure
  2. Installing RFID tags on each vehicle
  3. Additional maintenance cost
- **Future scope:**
  1. Reducing cost of overall model
  2. Making use of readers having more range



THANK YOU!



RESOURCES

1. https://1drv.ms/w/s!Aict8motOIa8hWssuM3gCkDRjqIL?e=YWykji
2. https://www.sciencedirect.com/science/article/abs/pii/S1389128618304845
3. https://www.researchgate.net/publication/340399678_SensorBased_Traffic_Control_System
4. https://link.springer.com/article/10.1007/s00521-015-1931-y
5. https://ieeexplore.ieee.org/abstract/document/8275131
6. https://www.mdpi.com/1424-8220/16/2/157
7. https://www.automatesystems.co.uk/how-traffic-light-sensors-work/
8. https://cafetarjome.com/wp-content/uploads/267/translation/order-z1470402606-2135.pdf
9. https://www.electronicwings.com/sensors-modules/rfid-reader-em18
10. https://www.researchgate.net/publication/340399678_SensorBased_Traffic_Control_System
11. 9. https://www.best-microcontrollerprojects.com/16F877A.html#:~:text=The%20popular%2016F877A.,the%20other%20 more%20modern%20PIC’s
12. https://www.canva.com/
13. https://slidesgo.com/