REVA UNIVERSITY
Bengaluru, India

MINI PROJECT
ON
VEHICLE TO VEHICLE COMMUNICATION SYSTEM

Project Group ID: F3 **Section: F**

By

SACHIN SHARNGOWDA R16CS355

SAGAR.B.DOLLIN R16CS356

SANJAY.K.R R16CS370

SANJAY KUMAR .K R16CS371

Under the guidance of

Mr. Manjunath P.C.

(assistant professor)

CONTENTS

ABSTRACT

- This project focuses on controlling the road traffic by demonstrating various traffic situation and how they can be overcome.
- Our project aims to add more features to autonomous vehicles to control traffic and to reduce accident risks .
- This will be demonstrated using mini RC CARS using Arduino. Clearly autonomous vehicles are the future and we work for a better future.

INTRODUCTION

- Our project aims to control the traffic and save a lot of precious time. Each vehicle on the road is an independent vehicle irrespective of whether it is autonomous or manually driven.
- Our goal is to connect all the independent vehicles to a server that regulates traffic. This system will provide a new dimension to autonomous vehicles as independent autonomous vehicles depend mostly on visual data that they get from the surrounding.
- Creating a link between them would result in taking more accurate and appropriate decision. Our project demonstrates the creation of link between vehicles to avoid traffic jams and accidents by using mini RC CARS and implementation of Arduino.
- These mini cars would be able to communicate to each other via a computer which will act as a server and we intend to design an algorithm that would regulate the traffic of these mini cars.
- Every car would be aware of the surrounding cars- their speed, direction, the route that they intend to go. This will Provide a broad range of data to make more accurate decisions by the algorithm.

PROBLEM STATEMENT

Meet Peter
A school going kid.

This is how Peter's way to school looks like

The observations that peter made on his way to school are:-

- It takes at least 45 mins to cover the distance of 10 kms.
- Usually the ambulances get stuck in the traffic
- Sometimes the traffic police are unable to clear the traffic on time.

Vehicle to vehicle communication can save time,fuel and lives.

Basic Model:

Sharing of data

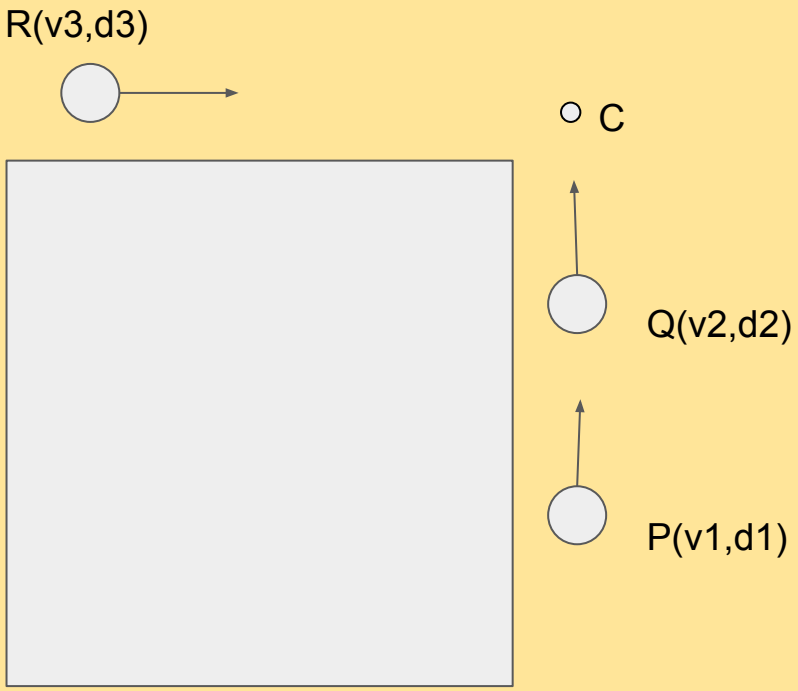
A.speed

B. position

C. projected path

We will also be able to tackle the problem of accidents.

Meet Dr. Mewton
He is all about math and he has presented us a collision problem



There are 3 ways in which the particles may collide;

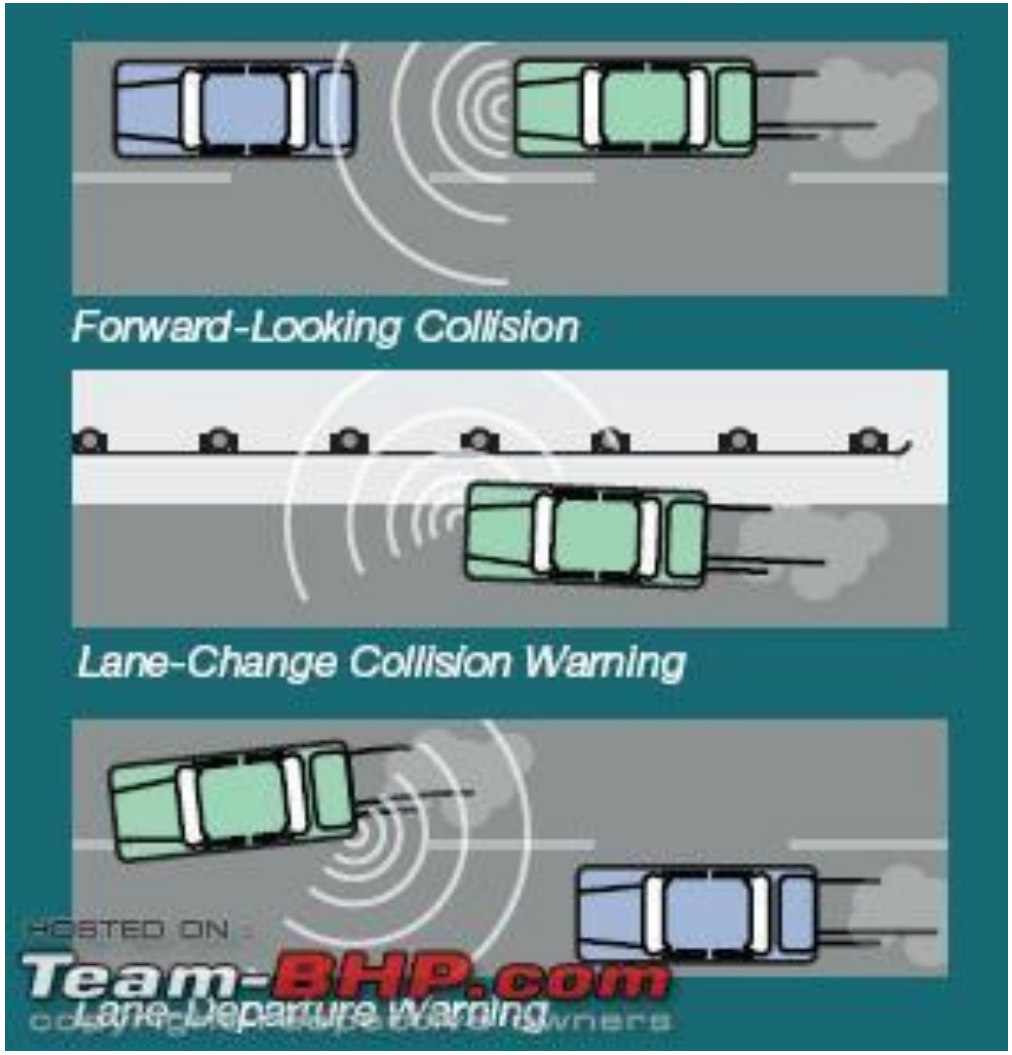
- PQ collision
- QR collision
- PQR collision
- PR collision

There are several ways in which the collisions can be avoided
We will consider 8 practical possibilities.

P(collision)=4/12=0.3

Our algorithm chooses one of 6 possible solution to avoid collision.


Lets have a look on
possible practical
collisions.

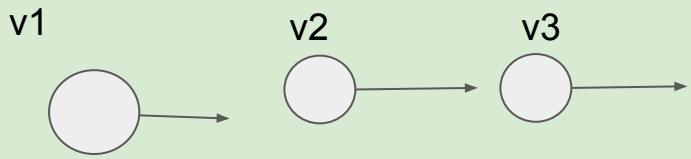


These are few scenarios possible of collision while on road.

- ➔ Forward looking collision
- ➔ Lane change collision
- ➔ Lane departure warning

The solution to all these problems are implemented in the following ways:

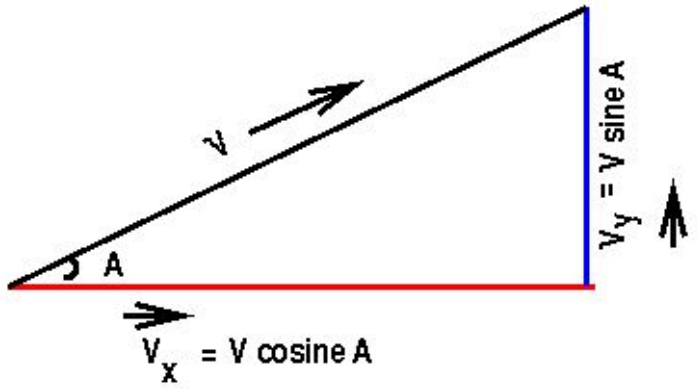
1)Platooning



Where
v1=v2=v3 ...

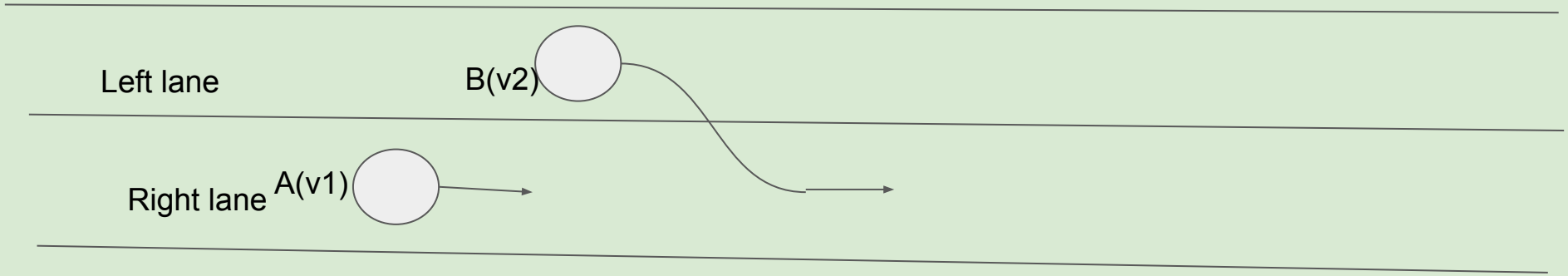
2)Lane change solution

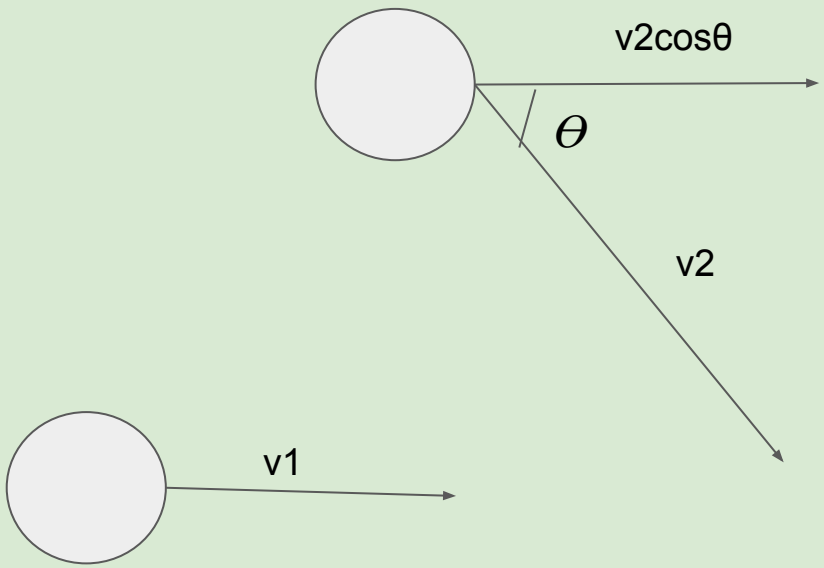
Before going to the solution Dr Mewton wants us to recall the velocity vector problems.



Velocity is a vector quantity: It has a direction.

What must be the velocity of both the vehicles to avoid collision?
Are the velocities relative?





Here to avoid collision the horizontal velocity of both the vehicles must be equal.

Therefore,

$v1=v2\cos\theta$

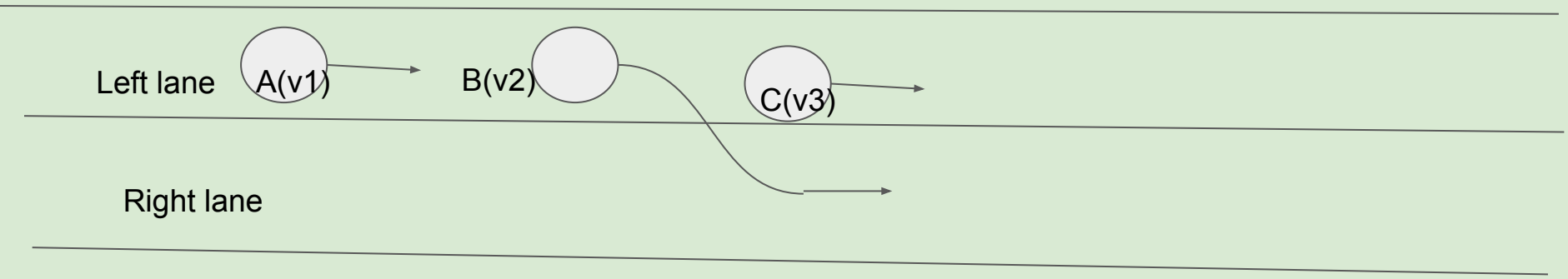
This implies

$v2=v1/\cos\theta$

I.e.,

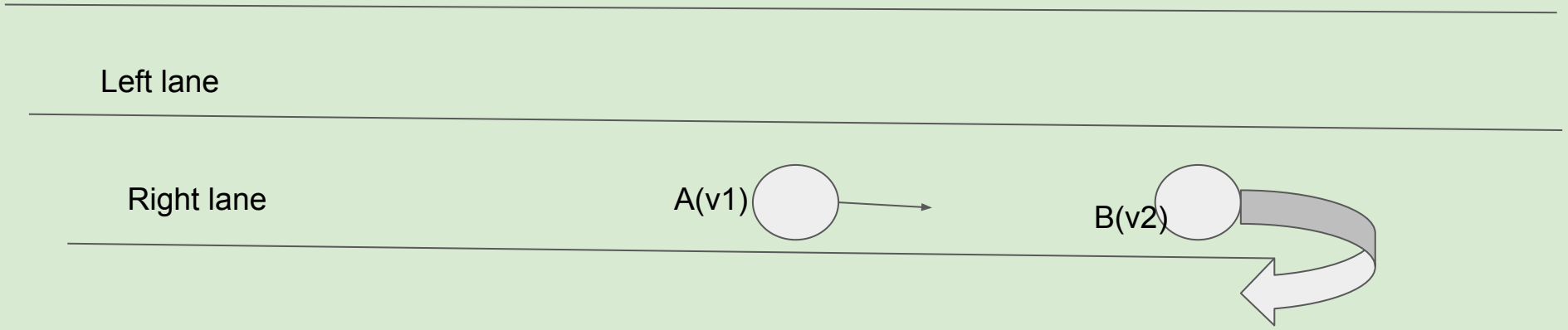
$$\mathbf{v2=v1\sec\theta}$$

3)Lane change warning

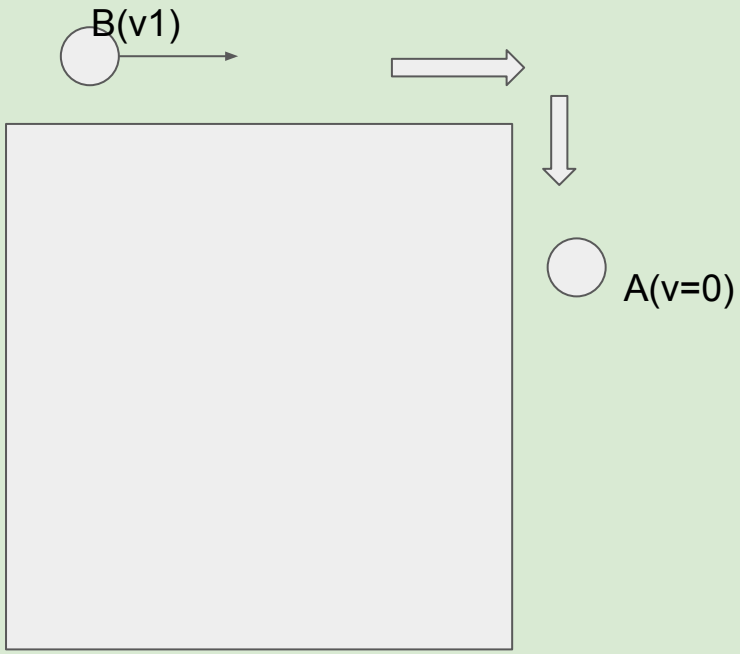


In this case when B changes lane then it must send a warning to A and C so that they both can be platooned i.e.,
v1=v3

4)U-Turn/turn Warning

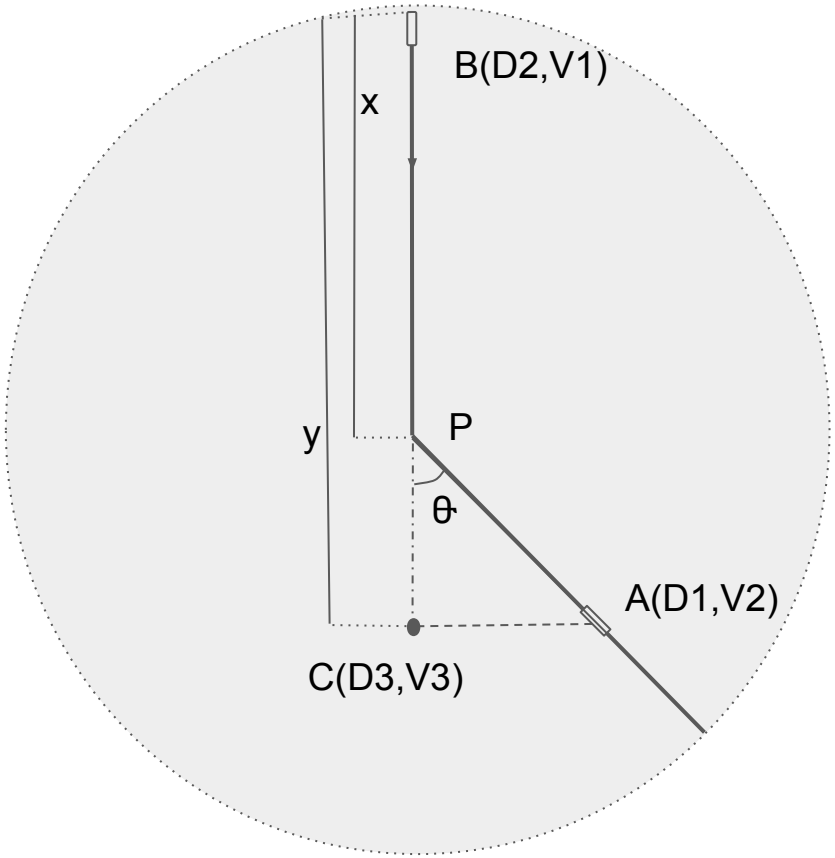


5)Blind spot warning



UNIFIED SOLUTION

THE CIRCLE ALGORITHM



V1=(y-x)/t

V2cosΘ=x/t

Collision Ratio

V1/V2 cosΘ =(y-x)/x

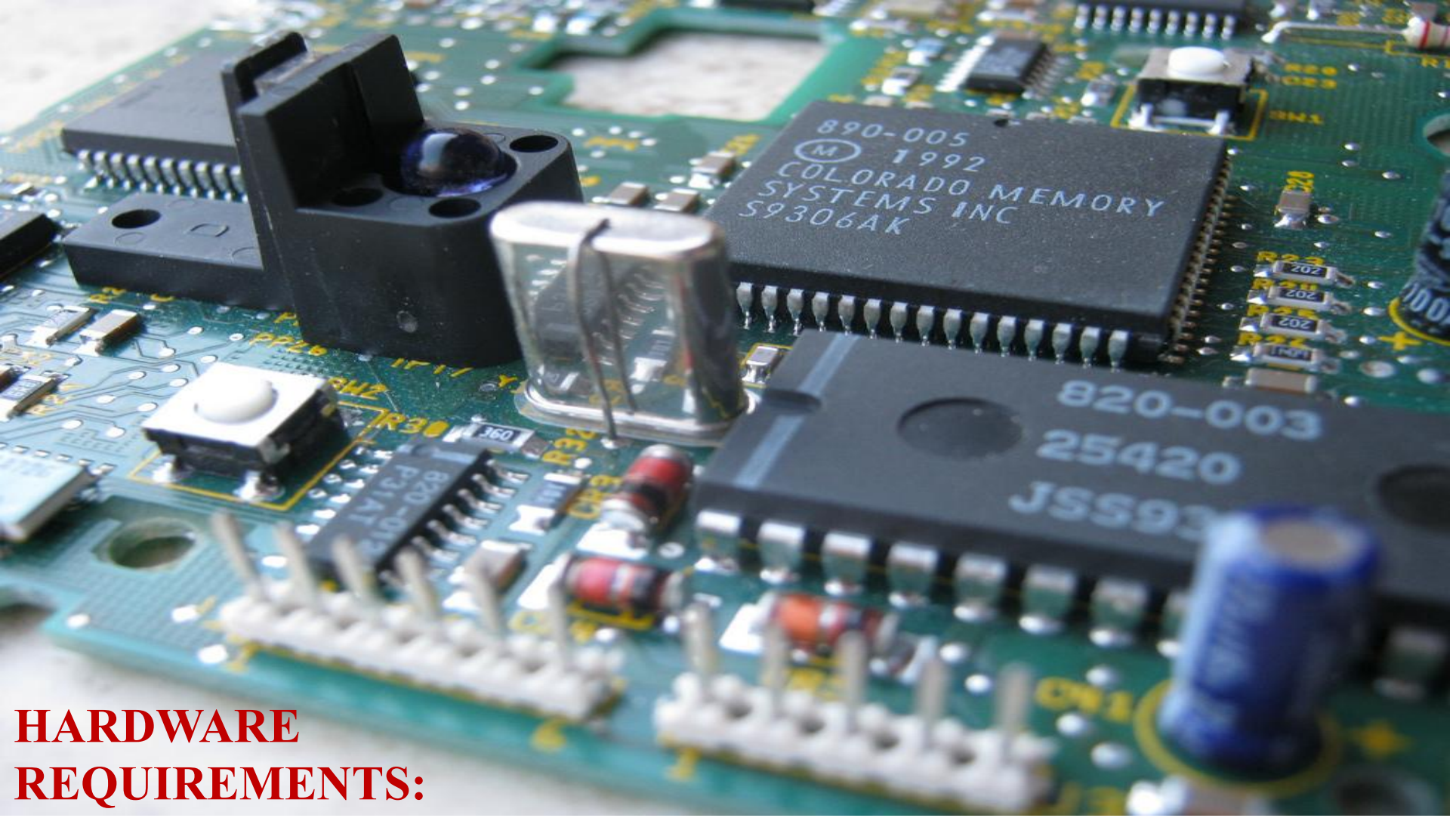
Or we can write the collision ratio as

$$= \frac{z(y-x)}{zx}$$

Where z is any real number.

SYSTEM REQUIREMENTS:

- As we have mentioned earlier, we will be using RC CARS to demonstrate real life situations of traffic.
- The RC CARS will be connected to computers through arduino . We will need Arduino software to do it. And rc board that is used to use a RF controlled car to be connected using antenna.
- We will also need transmitters and receivers to be able to send and receive data of the speed , location and direction of the cars .



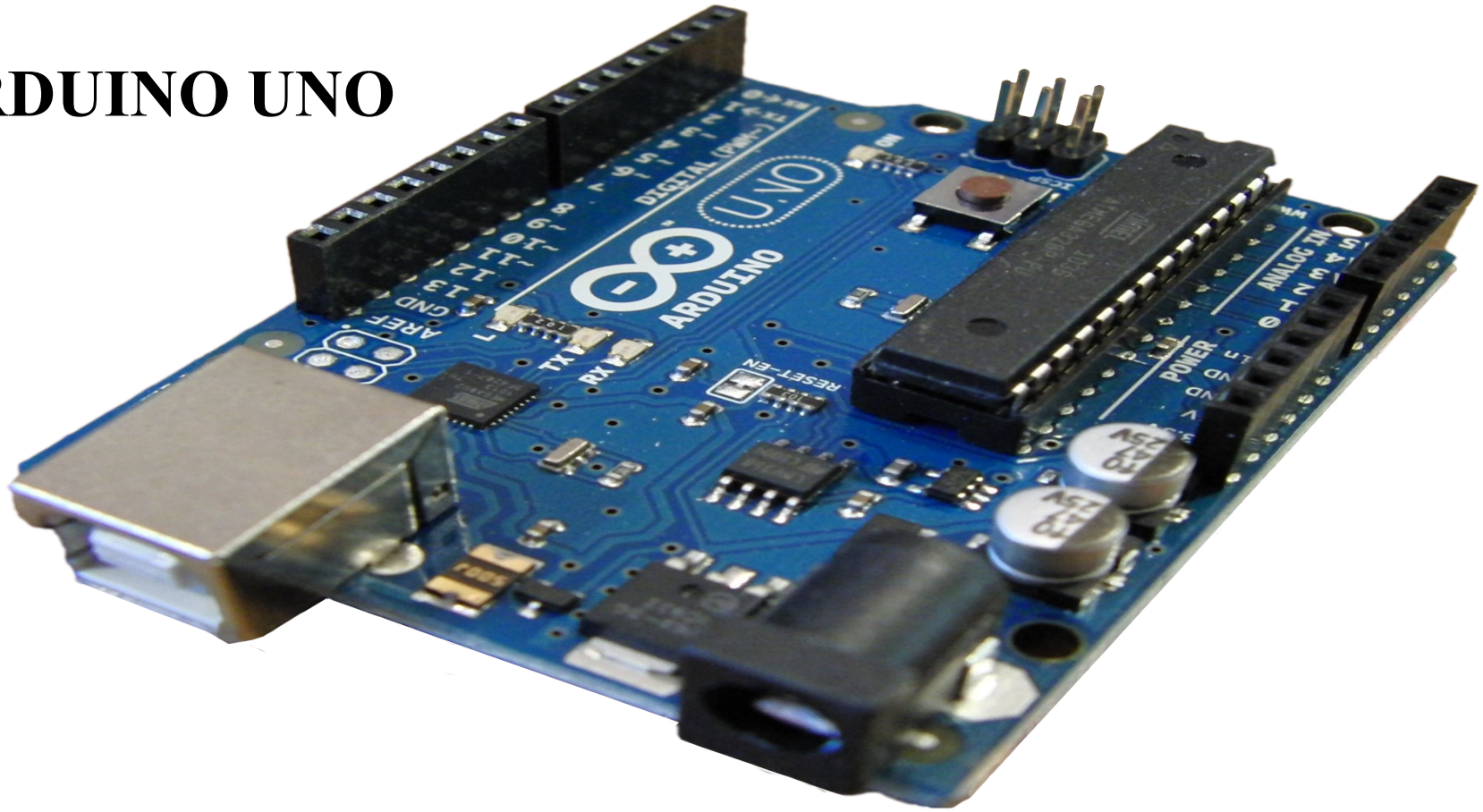
HARDWARE REQUIREMENTS:

RC CARS

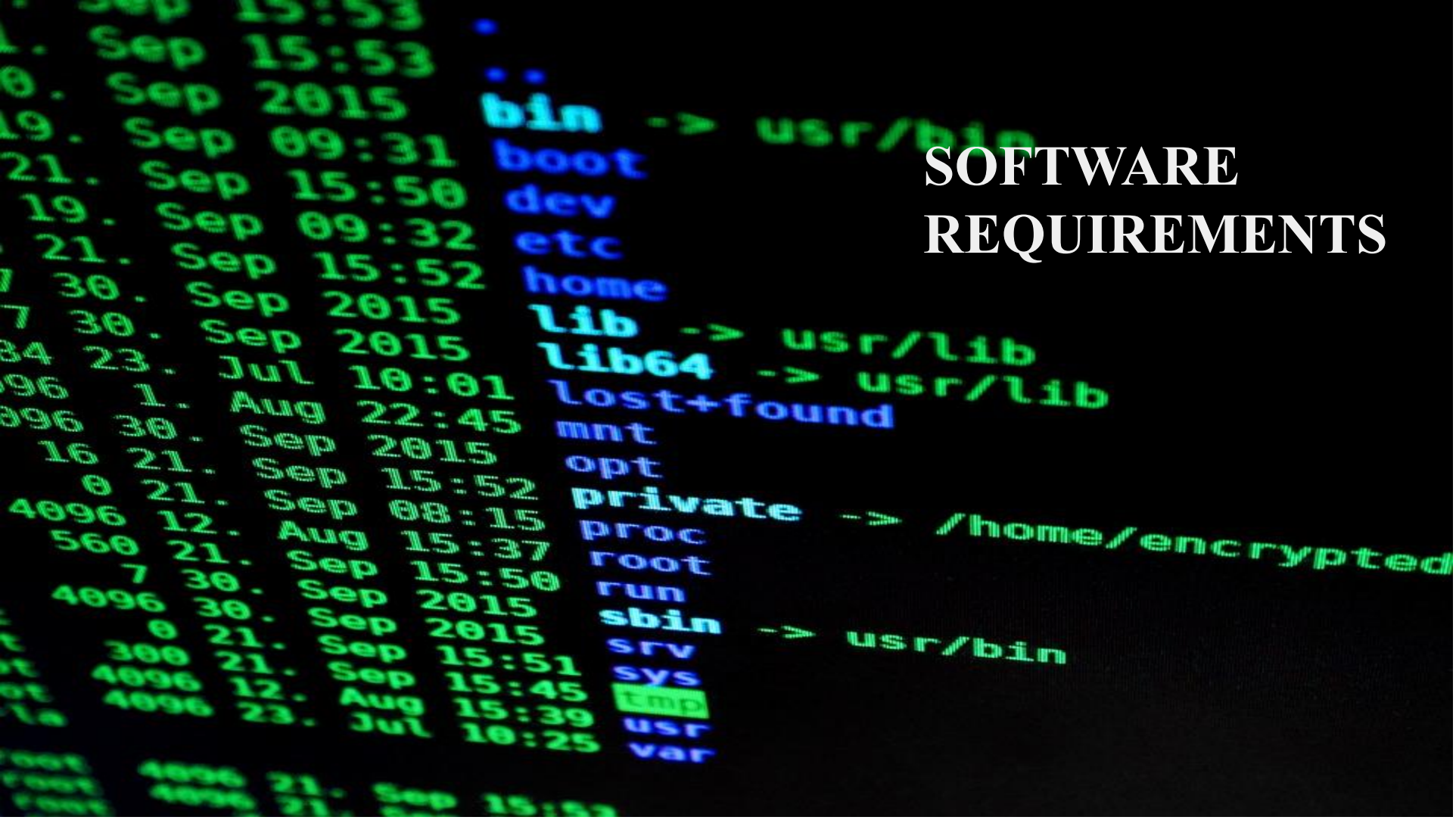
REMOTE CONTROLLER

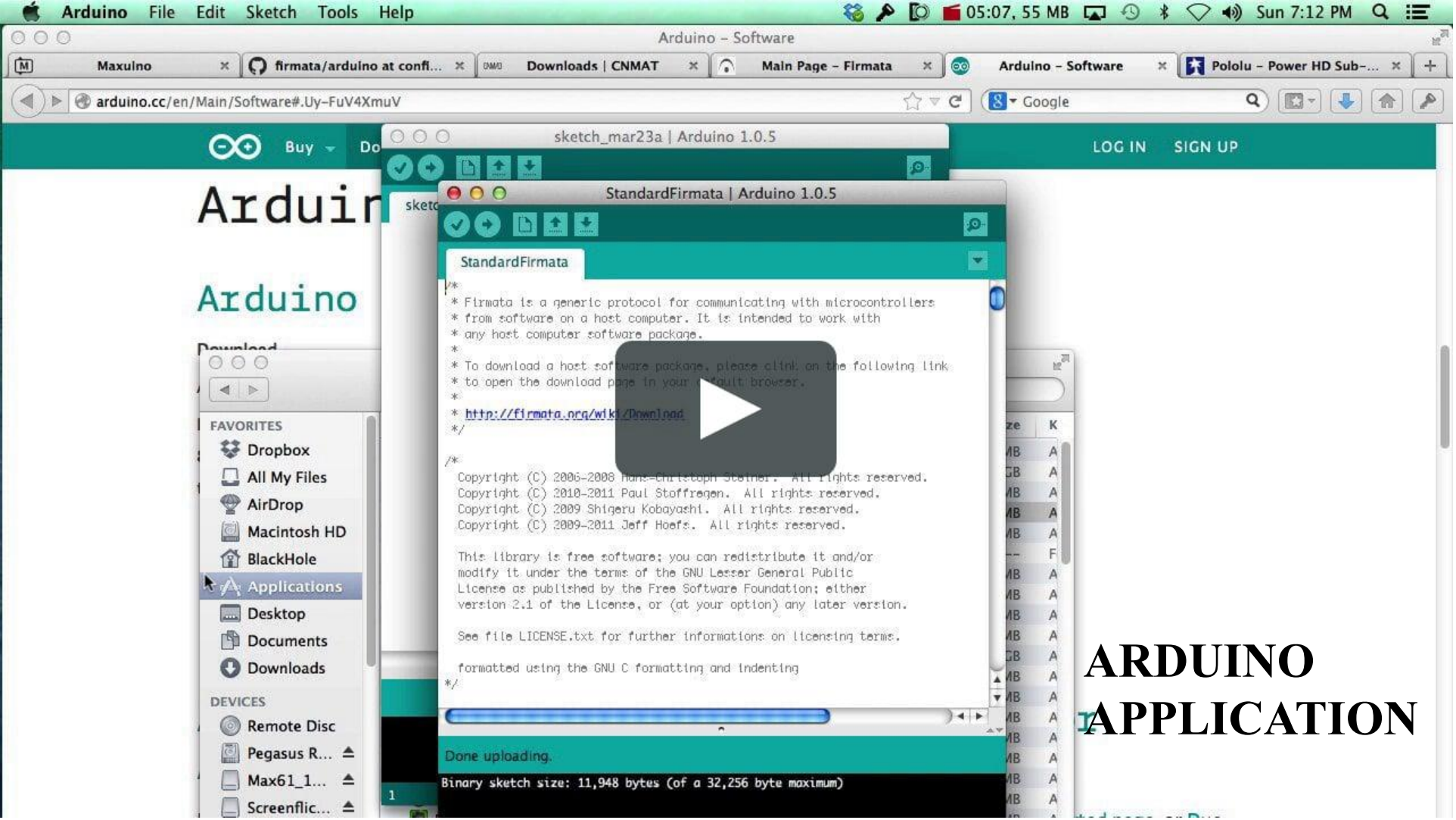
PATCH CORDS

ARDUINO UNO


DIGITAL (PWM~)
UNO
ARDUINO
AREF
GND
TX
RX
RESET-EN
POWER
ANALOG IN

SERVER SYSTEM

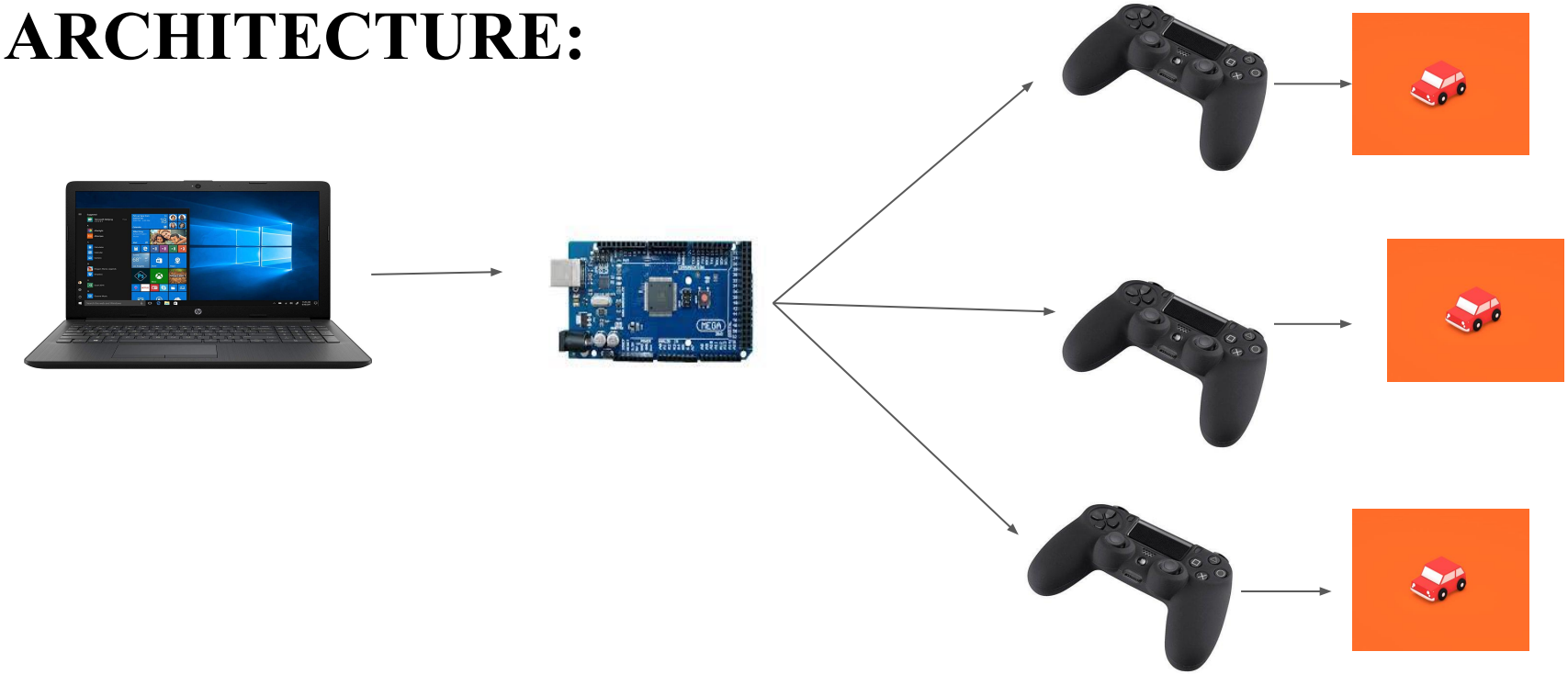

SOFTWARE
REQUIREMENTS



ARDUINO APPLICATION

OPERATING SYSTEM PLATFORM

ARCHITECTURE:



APPLICATIONS

- As we have highlighted the main objective earlier i,e. to clear the traffic and regulate it there are other important objectives that needs to be brought into the light.
- As we stated before the vehicles would foresee an emergency vehicle approaching before it gets any closer an appropriate decision to make way for the emergency vehicle is taken.
- If two vehicles approaching at an intersection from different routes knew about each other's positions beforehand the accident could be avoided easily.
- Platooning can be achieved easily where number of vehicles using same routes are grouped together at equal distances and one vehicle leads them sending information of the upcoming hurdles beforehand. Platooning is effective on highways and isn't very useful on busy roads .

Traffic control

Safety at intersections


GHAT SECTION
WARNINGS

EMERGENCY VEHICLES

AVOIDS PARKING CONGESTION

AVOIDS BLIND SPOT ACCIDENTS

CONCLUSION PHASE 1:

- AS PRESENTED EARLIER OUR ALGORITHM IS BASED ON THE MATHEMATICAL EQUATIONS EXPLAINED EARLIER.
- WE HAVE TRIED TO DERIVE SUCH EQUATIONS BASED ON FEW COMMON SCENARIOS.
- THE ALGORITHM IS STILL UNDER DEVELOPMENT.
- WE WILL BE USING WiSHIELD WHICH IS IMPLEMENTED TO CONNECT TO THE MC AND THE RC CARS.
- IF WE WANT TO USE BLUETOOTH WE REQUIRE OTHER HARDWARE COMPONENTS.

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