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WELCOME TO PRESENTATION

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On

Autonomous driving LEGO vehicle follower

As a requirement of

Advanced Real-Time Systems

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Presented By:

RTS Project Group-18

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Project Supervisor:

Prof. Dr. Jens Liebehenschel

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Abstraction of Project

We have two LEGO Mindstorm EV3 vehicle. First one is controlled by an android app via bluetooth. Second vehicle follows the first vehicle automatically.

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Three parts of the project

- Part –A : Mechanical Design & Construction
- Part – B : Controlling the 1st vehicle
- Part – C : Lego vehicle Follower(2nd vehicle)

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Part-A: Mechanical design and construction

- We used Lego toy tools to construct the vehicles. LEGO EV3 device is used as the robot kit which is placed at the top of the vehicle. Each vehicle is run by one big motor on four wheels.
- Ultrasonic sensor is placed in front of the vehicles

to detect the distance between vehicles smoothly.

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Part-A: Mechanical design and construction

- LEGO EV3 device has four input port named as 1, 2, 3, 4
- And four output port named as A, B, C, D
- The Ultrasonic sensor acts as input device and connected to input port 1.
- Motor is working as output device and connected to output port D.

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Part-A: Mechanical design and construction

- To get better reflection for ultra sonic sensor we added a white board at the end of 1st vehicle.

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PART –C: LEGO vehicle FOLLOWER

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Algorithm:

Step 1: set constant_distance cd, transition_distance td, critical_value

Step 2: turn on Ultrasonic sensor and measure distance

```
dist= getDistance();
Step 3:
while(flag!=false) {
dist= getDistance();
    if(dist>cd+ td) {
            while(dist>cd+ td) {
                    move the vehicle forward;
                    dist= getDistance();
            }
    }
    else if (cd+ td > dist &&dist>cd) {
            while(cd+ td > dist && dist>cd) {
                    move the vehicle forward slowly;
                    dist= getDistance();
            }
    }
```

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PART –C: LEGO vehicle FOLLOWER

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```
else if (dist== cd) {
        while(dist==cd) {
                move the vehicle forward in certain distance;
                dist= getDistance();
        }
}
else if(cd>dist && dist>critical_value) {
        while(cd>dist && dist>critical_value) {
                move the vehicle forward very slowly;
                dist= getDistance();
        }
}
else if(dist<critical_value) {
        while(dist<critical_value) {
                stop the vehicle and wait for next action;
                dist= getDistance();
        }
}
if(dist<.05) {flag=false;break;} // to avoid collision

}
```

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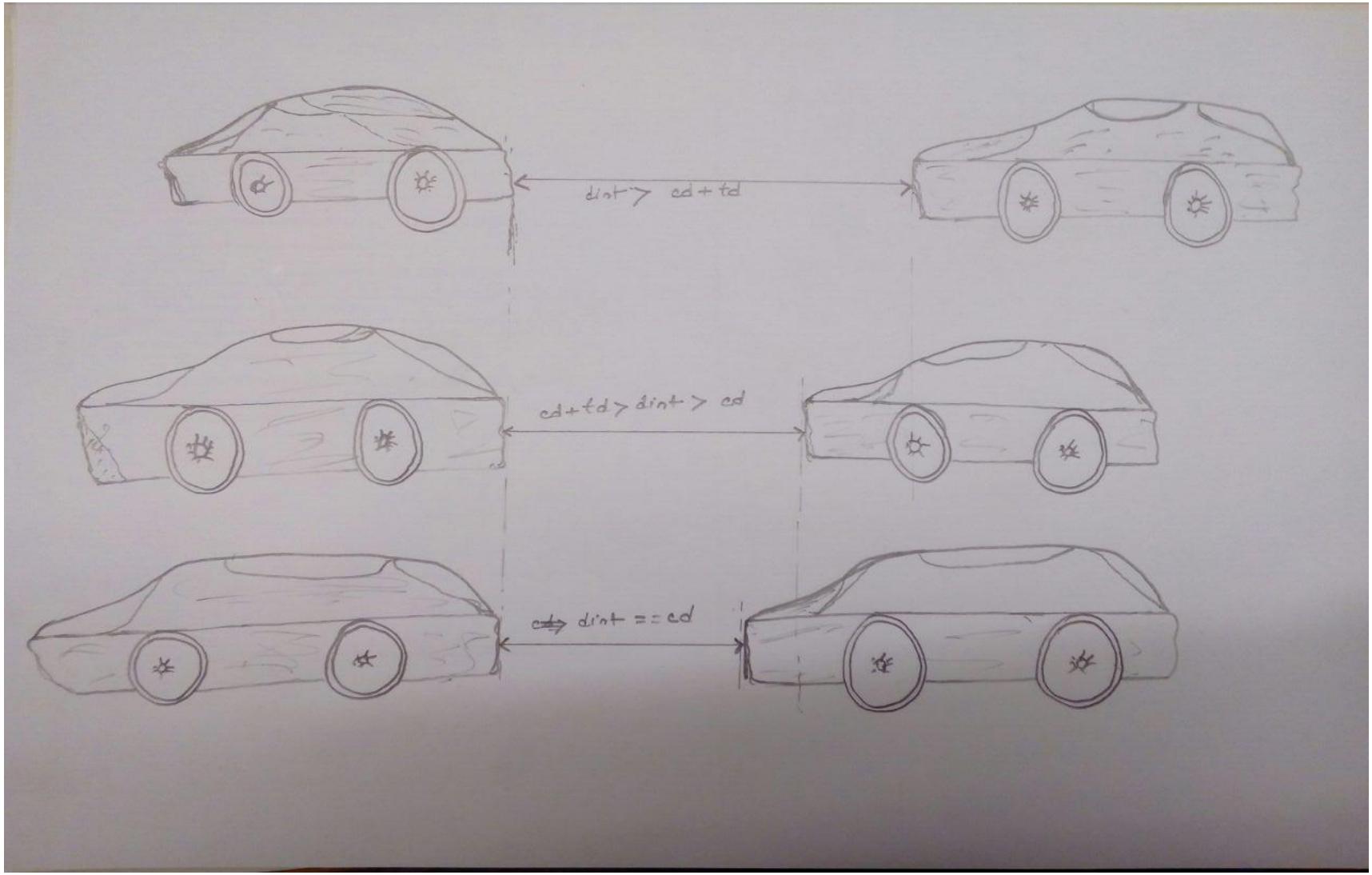

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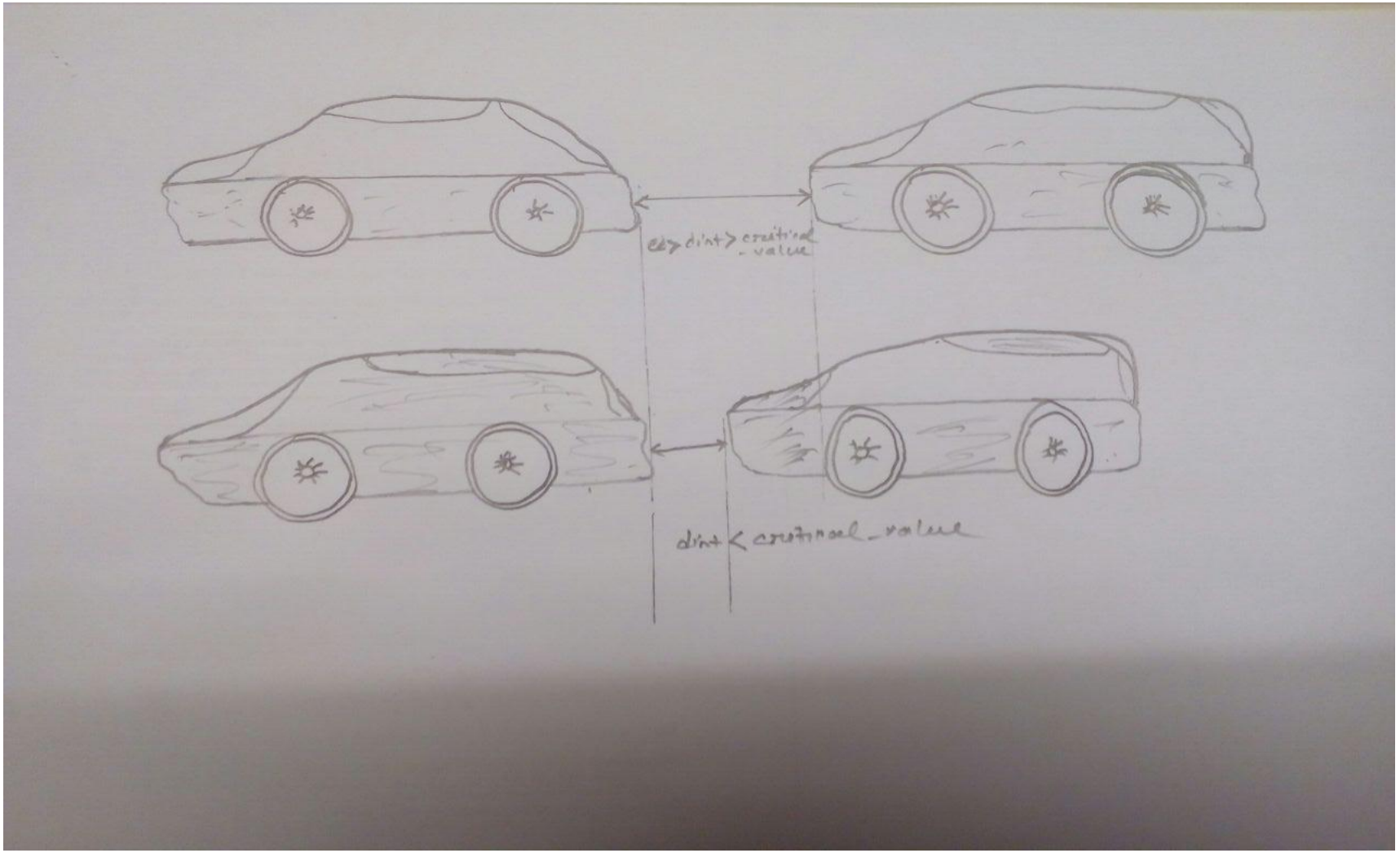

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Programming Tools and Language

- lejos EV3 based on JAVA
- Eclipse IDE
- External SD Card: 32 GB

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References:

[1] Wi-Fi (IEEE 802.11b) and Bluetooth
http://www.ti.com/pdfs/vf/bband/coexistence.pdf

[2] LEGO Mindstorms EV3 Programming Basics

https://www.sos.wa.gov/_assets/library/libraries/projects/youthservices/legomindstormsev3programmingbasics.pdf

[3] LEGO Mindstorms EV3 Programming Basics https://www.elprocus.com/obstacle-avoidance-robotic-vehicle/