MINI EXPLORER

FIRST PERSON DRIVING SIMULATOR SYSTEM

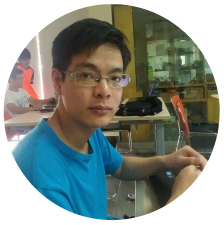
Project Code: MEx

Hanoi, September 1st 2017

Team Members

Supervisor

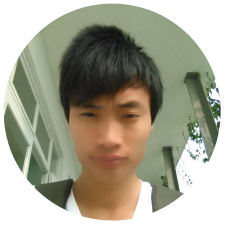
Mr. HOANG XUAN SON



Do Cao Phong
Software Developer

Pham Minh Hoang
Hardware Developer

Luyen Bao Anh
Team leader



Le Xuan Huong
Technical Leader

Phung Duc Luat
QA Leader

Dang Ngoc Tu
Test Leader

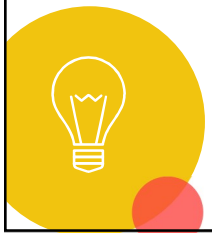
Presentation Agenda

1. Introductions
2. Project Management
3. System Specifications
4. System Design
5. Implementation & Testing
6. Product Demo – Q&A

1. INTRODUCTION

*How do we get **the problem** ?*

*How did **the idea** come to us ?*



THE PROBLEM

IDEA

- Create a remote control **automobile model.**
- Make a **remote controller** to simulate driving.
- Develop an application with **Virtual Reality** Technology to bring new experience.

2. PROJECT MANAGEMENT

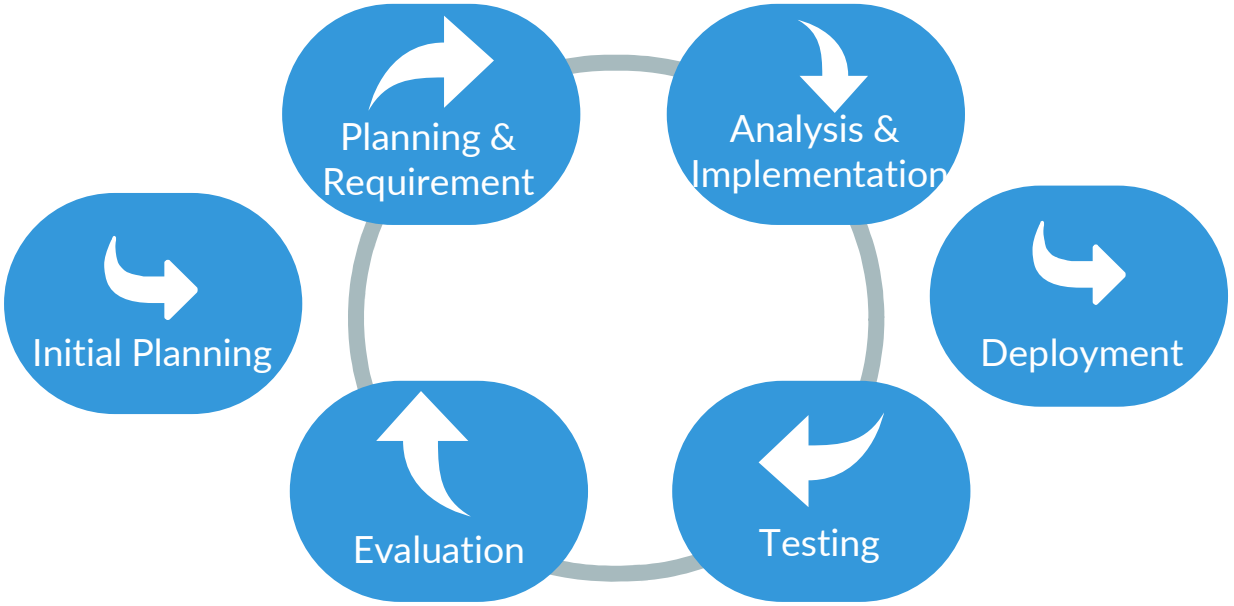
System development plan

Development tools

Risk Management plan

System Development Plan

Process Model



Iterative and Incremental Software Process Model

System Development Plan

Team working

01 WORKING EVERYDAY

Spend 3 hours per day and 5 days per week.

02 MEETING EVERY WEEK

At FPT University Hoa Lac Campus

03 KEEPING IN TOUCH ON SOCIAL NETWORK

Send report at **Facebook** and join regular meeting at **Skype**

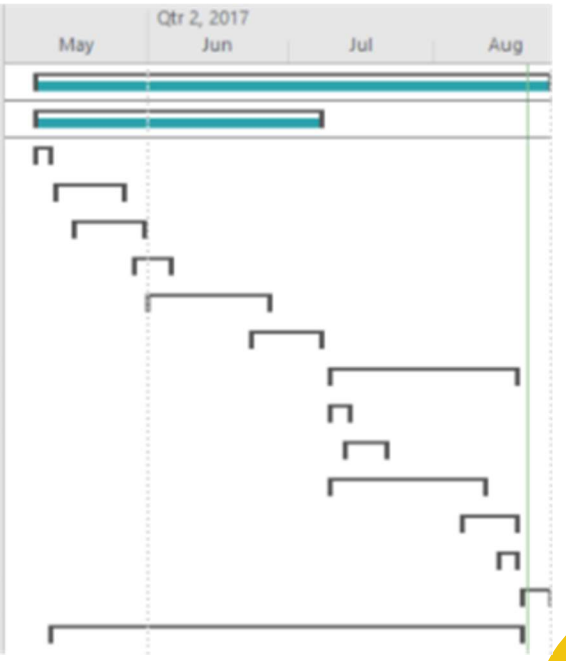
04 GETTING FEEDBACK FROM SUPERVISOR

Meeting supervisor once per week

System Development Plan

Project Plan

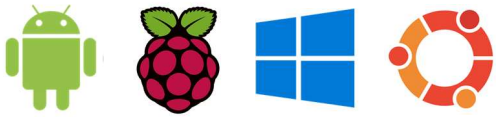
Task Name	Duration	Start	Finish
Capstone Project Plan	80 days	Mon 5/8/17	Fri 8/25/17
Phase 1: Create Function required for Car	45 days	Mon 5/8/17	Fri 7/7/17
1.1. Initiating	3 days	Mon 5/8/17	Wed 5/10/17
1.2. Planing and preparing	11 days	Fri 5/12/17	Fri 5/26/17
1.3. Technical understanding	11 days	Tue 5/16/17	Tue 5/30/17
1.4. Design	6 days	Mon 5/29/17	Mon 6/5/17
1.5. Implementation	18 days	Thu 6/1/17	Mon 6/26/17
1.6. Testing	11 days	Fri 6/23/17	Fri 7/7/17
Phase 2: Additional Function and Controller	30 days	Mon 7/10/17	Fri 8/18/17
2.1. Planning and preparing	4 days	Mon 7/10/17	Thu 7/13/17
2.2. Design	7 days	Thu 7/13/17	Fri 7/21/17
2.3. Implementation	25 days	Mon 7/10/17	Fri 8/11/17
2.4. Testing	10 days	Mon 8/7/17	Fri 8/18/17
2.5. Perform quality assurance	4 days	Tue 8/15/17	Fri 8/18/17
Prepare for the Thesis Defend	5 days	Sun 8/20/17	Fri 8/25/17
Document	72 days	Thu 5/11/17	Sat 8/19/17



Development Tools

4

Operating Systems

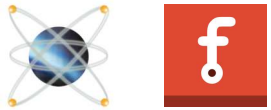


3

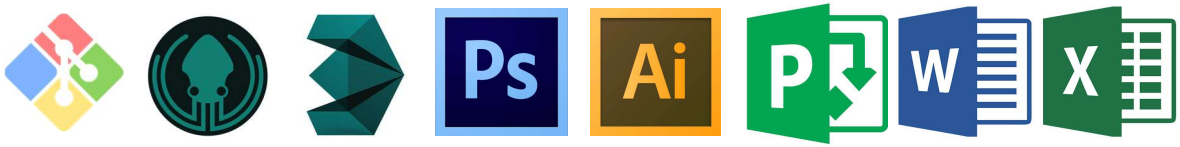
Programming Languages

2

Electronic Design Tools



Others:

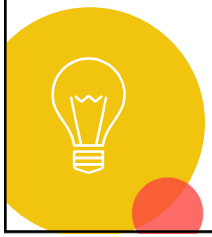


Risk management plan

Description	Avoidance plan	Contingency plan
The People	Team members may get some problems like illness, miscall, or having bad situation with health.	As soon as possible communicate with teammate and create a small meeting.
Hardware	Configuration and testing make devices or module broken.	As soon as possible replace or buy new devices. Read correctly datasheet.
Environment	In testing time, environment is wet, rain or hard to get Wi-Fi signal	Change time to re-test the test case or change location
Time	Team members have problem with schedule	Team leader creates new instance plan, make the project meets deadline

3. SYSTEM SPECIFICATIONS

- Business analysis
- Functional Requirement
- Non-functional Requirement

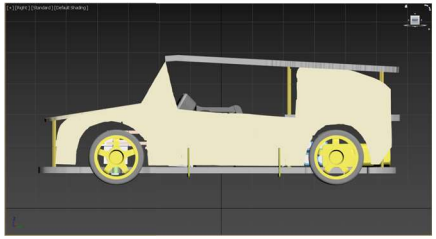


Business Analysis

Audi A1 Sportback

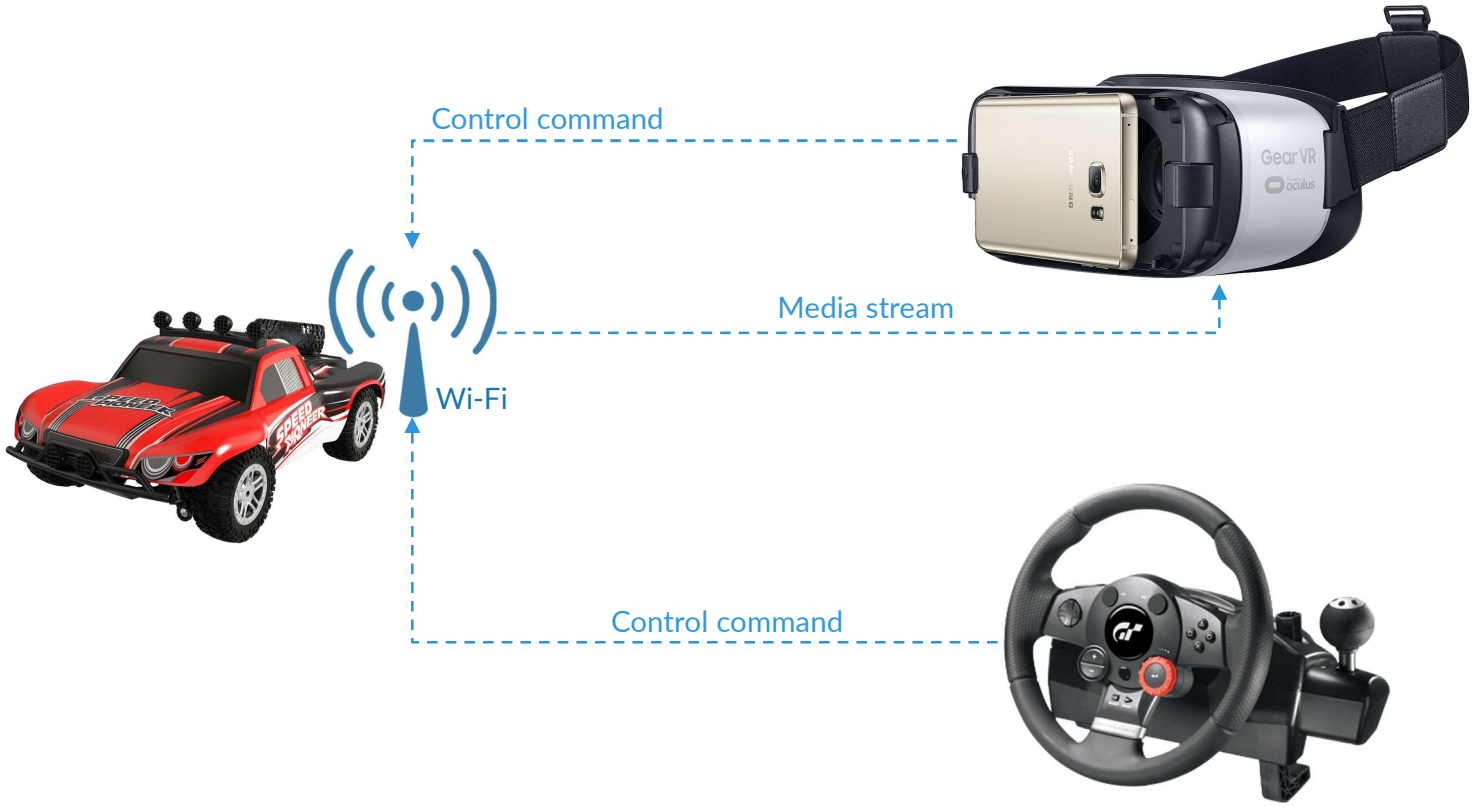
Automobile Model

Concept requirement

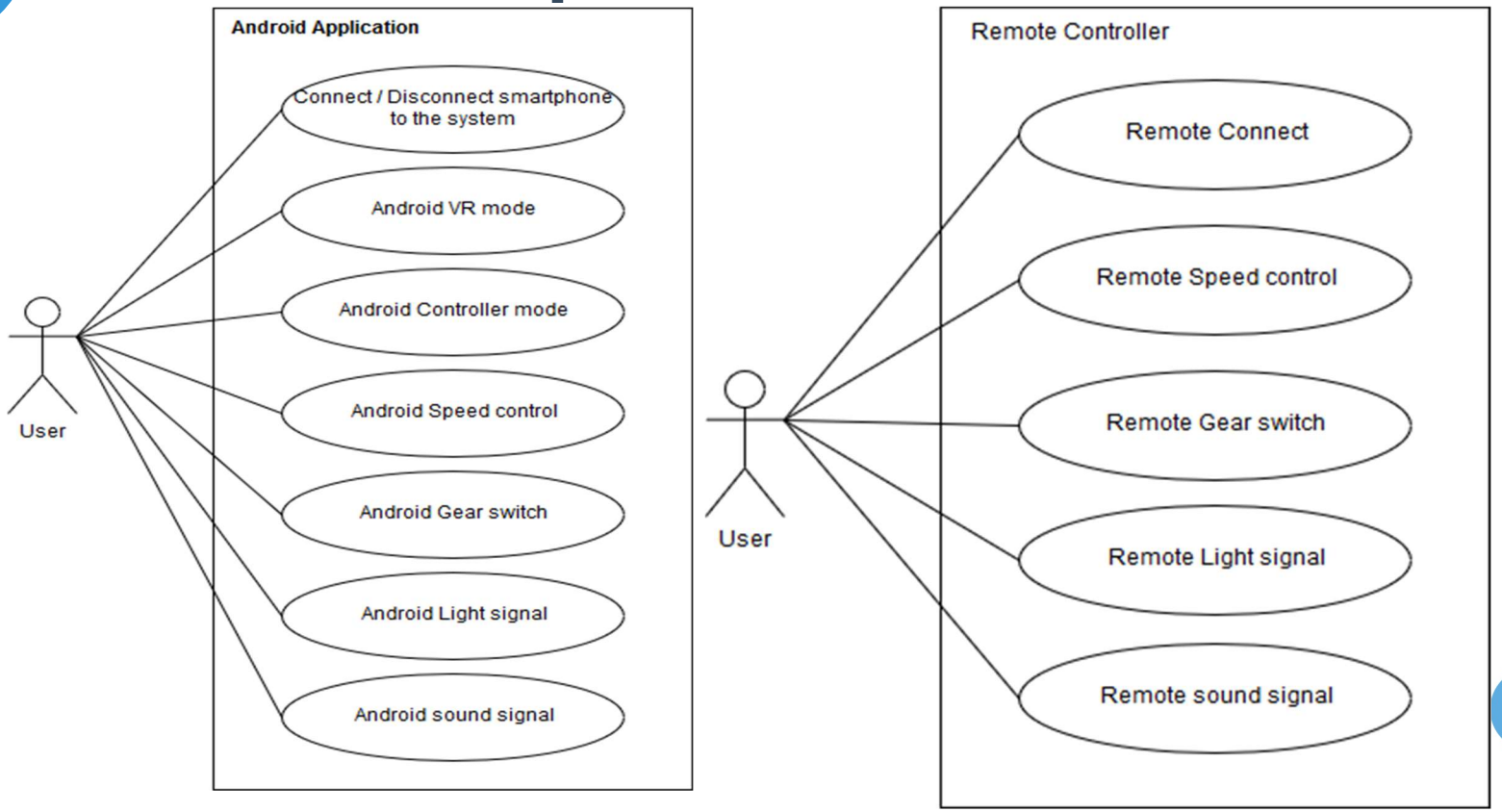



1 round
Steering wheel
4 rounds
Indicators stick
Brake pedal
Accelerator
Handbrake
3 gears
Automatic transmission
7 gears

System communication



Functional Requirement



Non-Functional Requirement

01
Reliability
- There is at least 95% of user command that will be successfully sent and executed to the car.

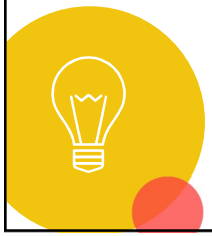
02
Maintainability
- Flexible mechanical designing to make it easy to replace any robot components.
- The hardware components are all available, and easy to purchase.

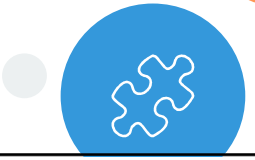
04
Security
- Wi-Fi network secure by WPA method. Each device has own SSID and Password.
- Just allow max one Android Device and one Remote Controller at the same time.

03
Performance
- The car has to response one user command in less than 0.1s.
- Media streaming has delay time less than 0.2s

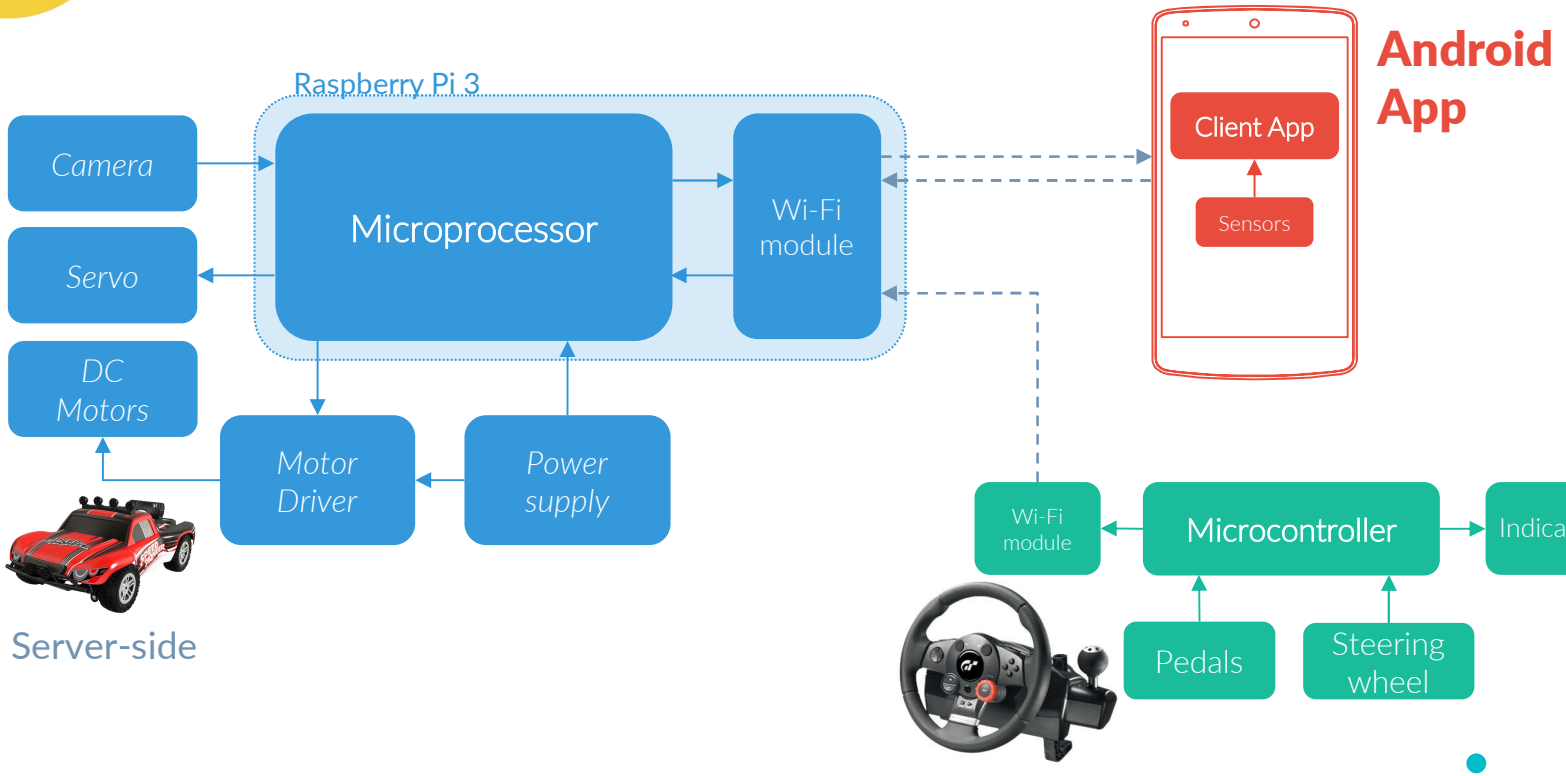
4. SYSTEM DESIGN

- System Architecture Design
- Software Design
- Hardware Design
- Hardware device list



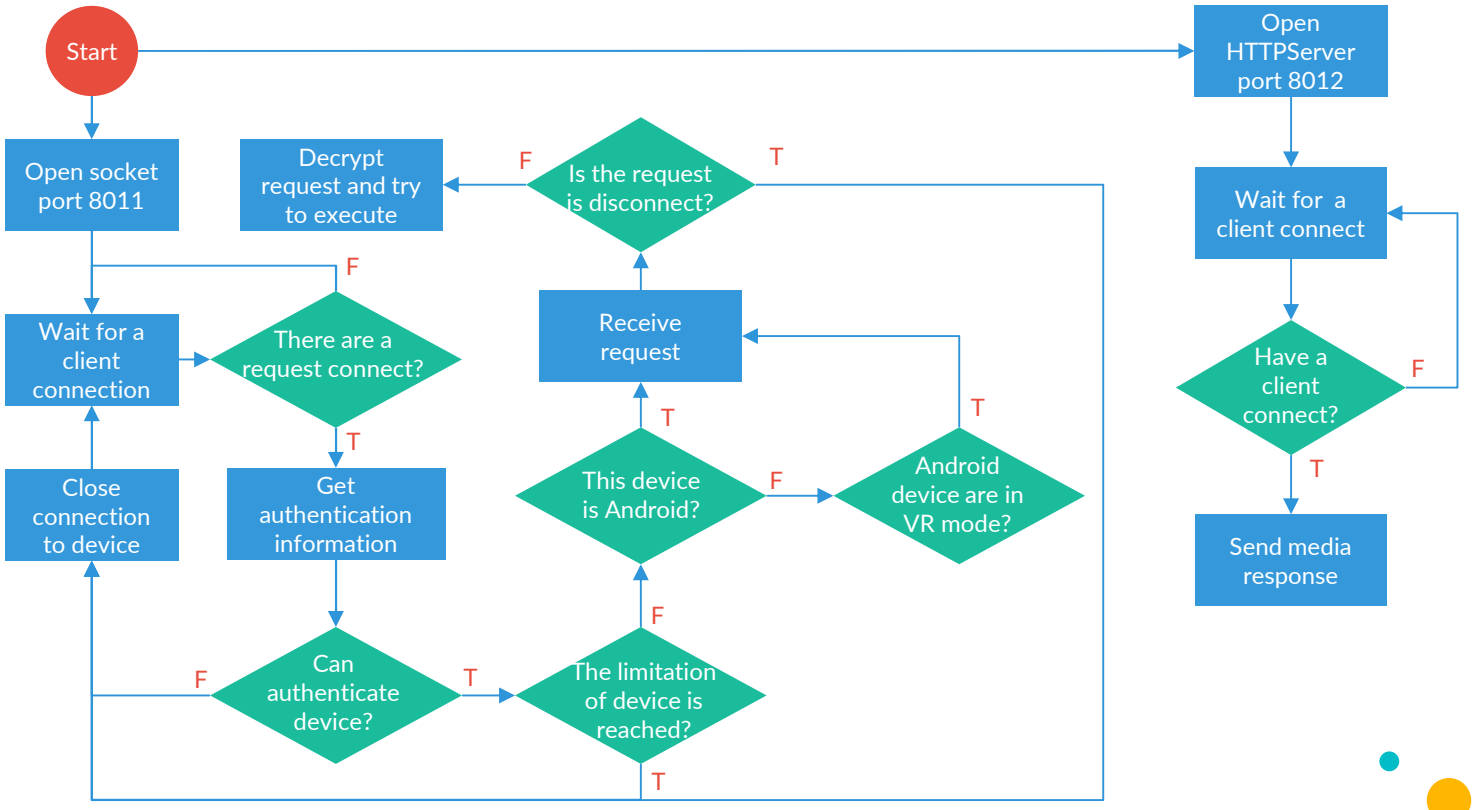


System Architecture Design



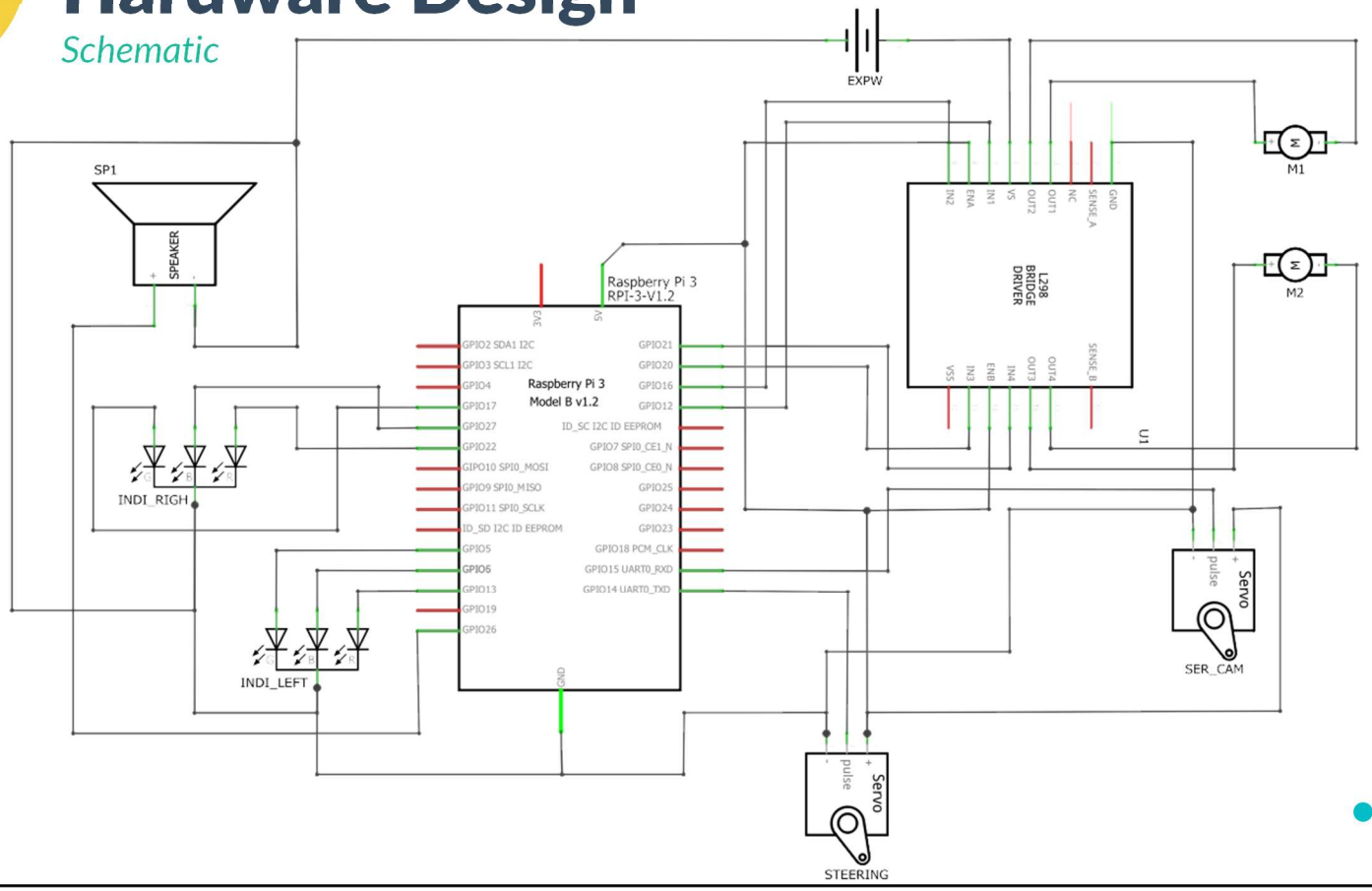
Software Design

Server-side process



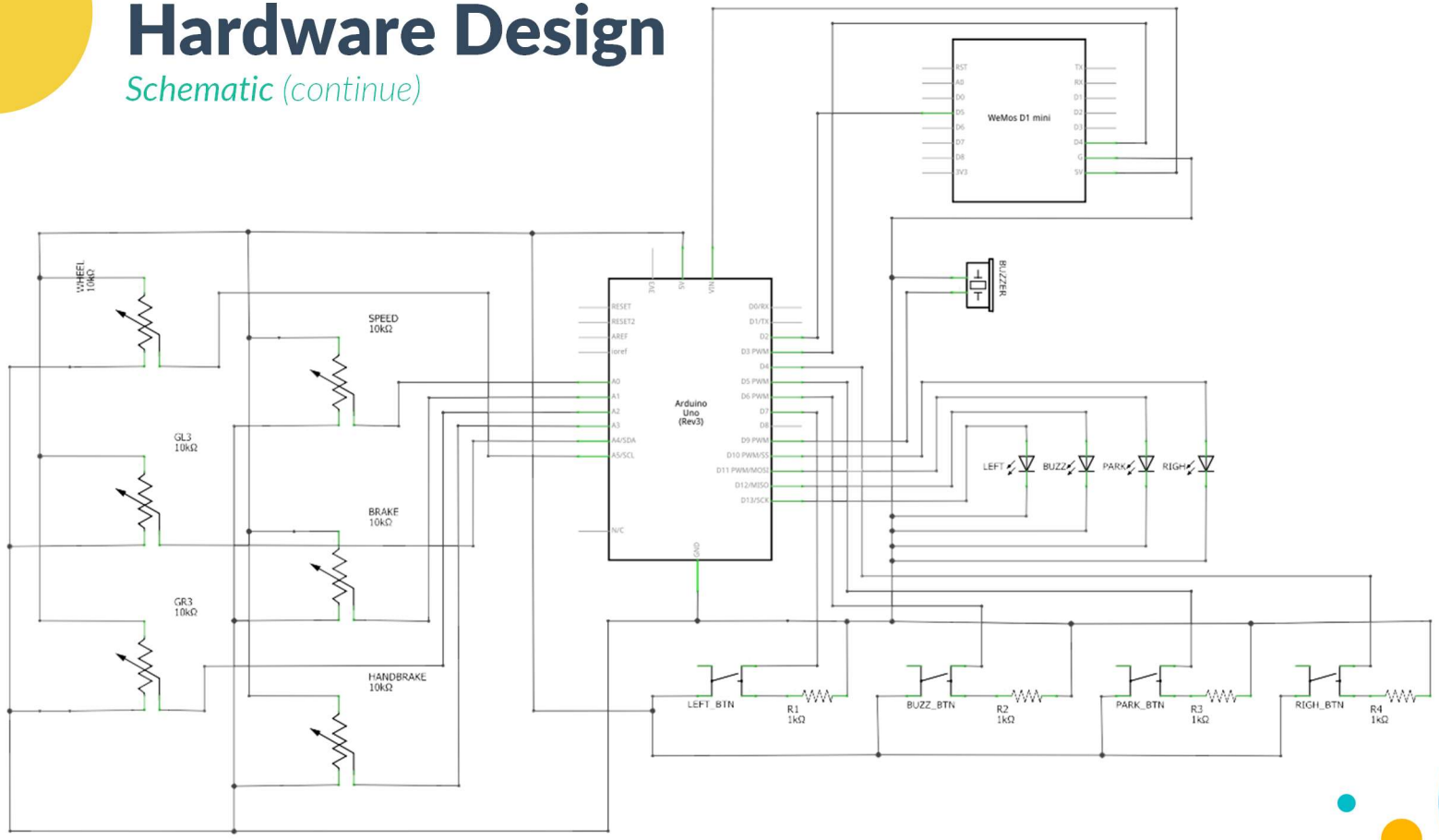
Hardware Design

Schematic

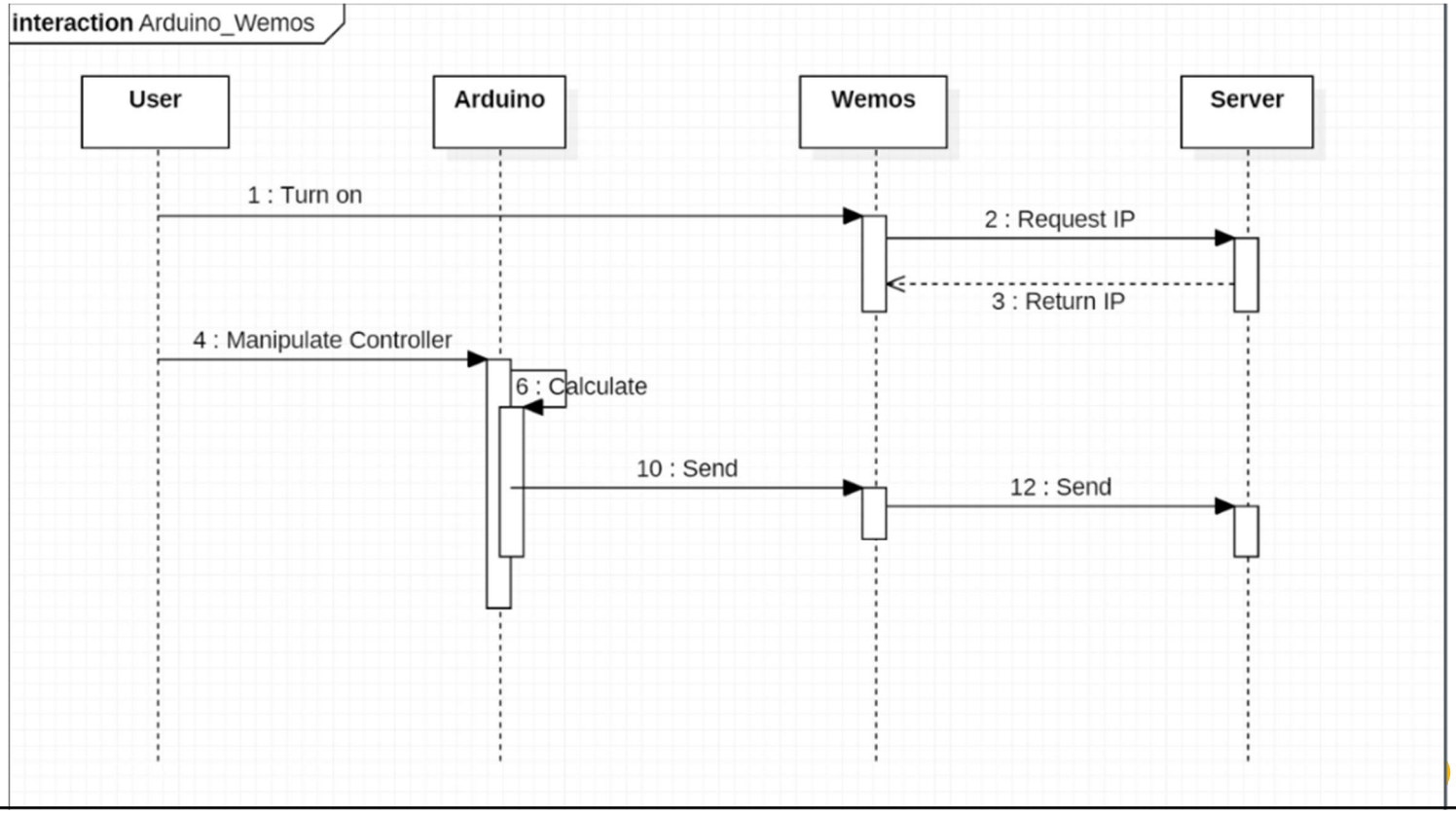


Hardware Design

Schematic (continue)

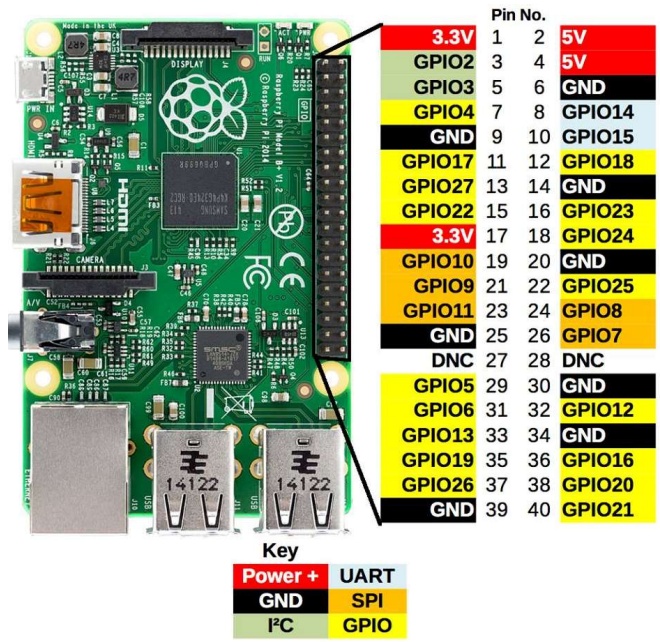


Firmware Design



Hardware Devices

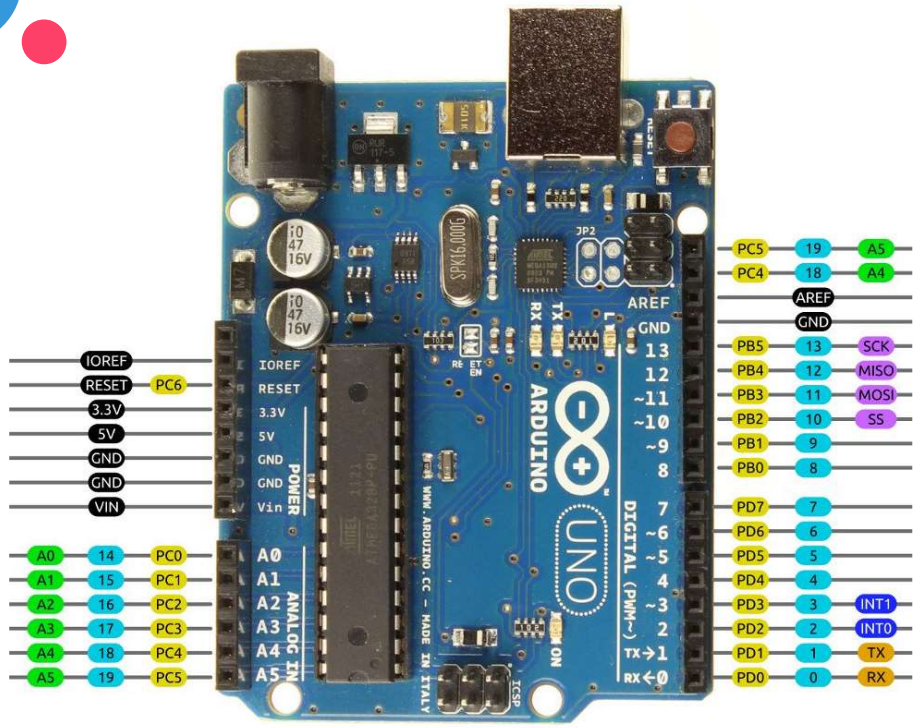
Raspberry Pi 3 Model B



Processor	Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache
GPU	Broadcom VideoCore IV @ 250 MHz OpenGL ES 2.0 MPEG-2 and VC-1
Memory	1GB
Operating System	Boots from Micro SD card, running a version of the Linux operating system or Windows 10 IoT
Network	10/100 Mbit/s Ethernet, 802.11n wireless built-in, Bluetooth 4.1
GPIO Connector	40-pin 2.54 mm (100 mil) expansion header: 2x20 strip Providing 27 GPIO pins as well as +3.3 V, +5 V and GND supply lines

Hardware Devices

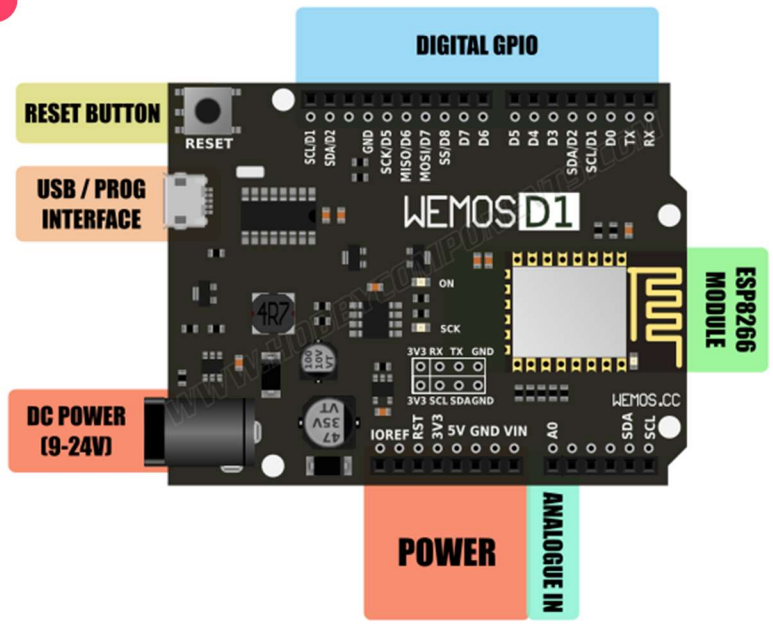
Arduino Uno R3



Microcontroller	ATmega328
Architecture	AVR
Operating Voltage	5V
Flash memory	32KB of which 0.5 KB used by bootloader
SRAM	2KB
Clock Speed	16 MHZ
EEPROM	1 KB
DC Current per I/O pins	40 mA on I/O pins; 50 mA on 3.3V pin
Input Voltage	7 – 12 V
Digital I/O pins	20
Analog I/O Pins	6
Board Dimensions	68.6mm x 53.4mm

Hardware Devices

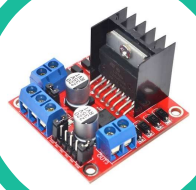
WeMos D1



Microcontroller	ESP8266
Operating Voltage	3.3V
Input Voltage Range	9V to 24V
Output	5V at 1A max
Digital I/O pins	11
Analog input pins	1
Flash Memory	4MB
Board Dimensions	68.6mm x 53.4mm
Weight	21.8g

Hardware Devices

Other modules



L298N
Motor Controller

Power supply	*+5 V ~ +35 V*
Peak output current	*2A/channel*
Logic power output	*+5 V ~ +7 V*
Logic current	*0 ~ 36mA*
Max power	*20W(Temperature 75 ℃)*
Working temperature	*-25 ℃~ +130 ℃*

TP4056
Charging circuit

Input voltage	*4.5 ~ 5.5V*
Full charge voltage	*4.2V*
Working temperature	*-10°C ~ +85°C*
Charging Current	*1A*

XL6009
Switching Current Boost

Input voltage	*3.2V ~ 32V*
Output Voltage	*4V ~ 38V*
Rated output current	*3A*
Peak Output Current	*4A*
Conversion efficiency	*Up to 94%*

MP1584
Step-down Regulator

Voltage input	*4.5-28V*
Voltage output	*5V*
Current output	*3A*
Size	*22x17mm*

Hardware Devices

Equipment

1 

Logitech C170

Video capture: Up to 1024 x 768 pixels
Hi-Speed USB 2.0 certified

2 

Gear speed-reducer
DC Motor

Input voltage : 3~9V, current : 150 ~ 200mA
Transfer rate : 1/40

2 

Servo MG996

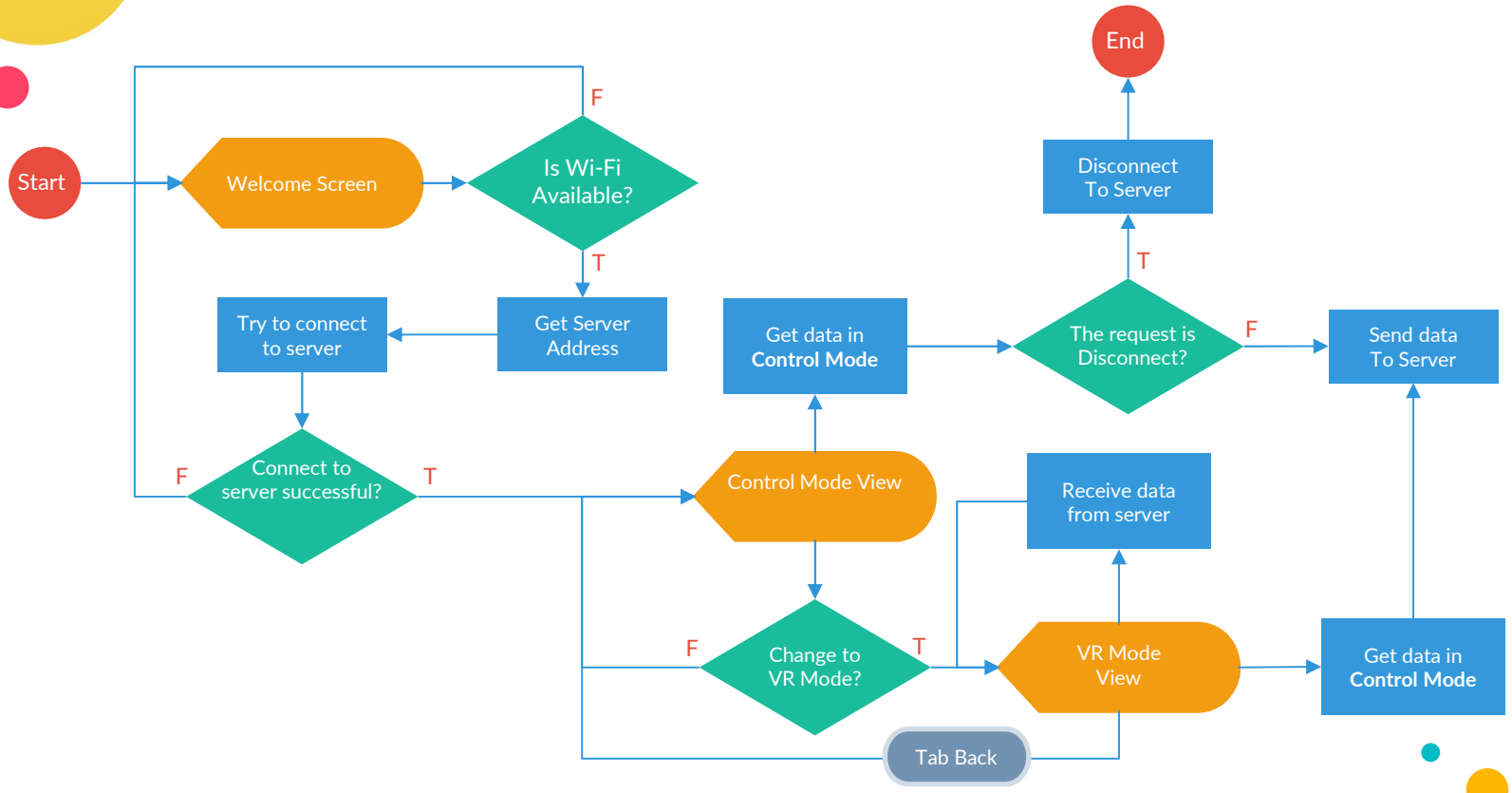
Digital servo features metal gearing
Operating Voltage: 4.8V ~ 7.2V
Running current: 500mA ~ 900mA (6V)

1 

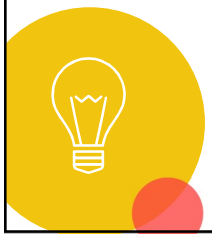
Buzzer

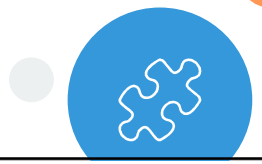
Operating Voltage: 5V
Use to indicate like automobile buzzer

Application Design



5. IMPLEMENTATION & TESTING

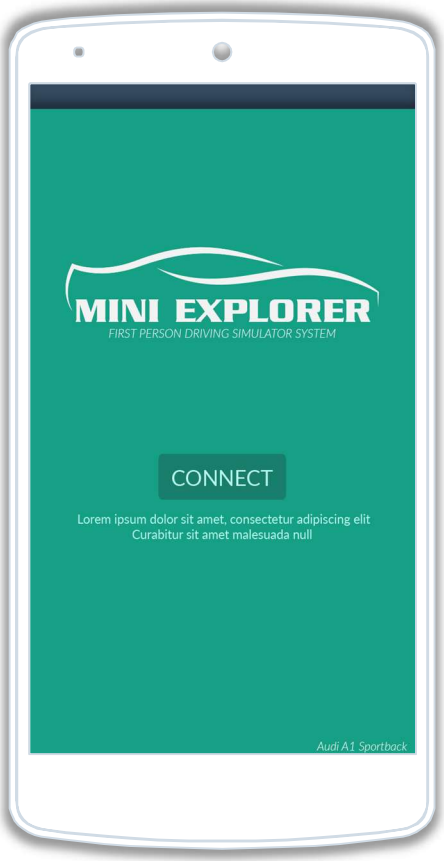


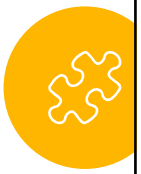


Android Client Application

Welcome Screen

Introduce to device connection





Android Client Application

Controller Mode

Control with streaming media from Automobile Model

Virtual Reality Mode

Experience the first person view with VR Glasses

Remote Controller

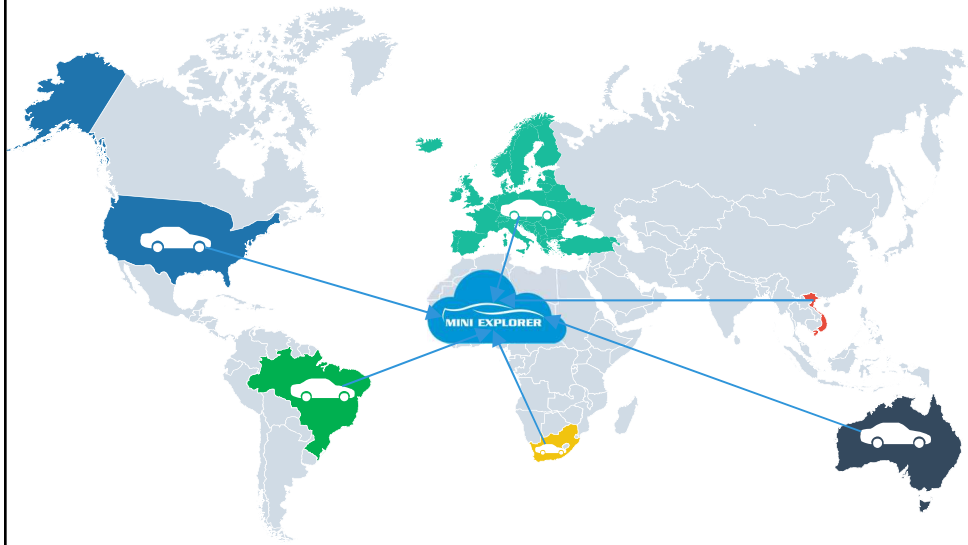
Arduino & **WeMos** inside
Collect data from **Rotary resistance**
and **Button**

Testing

PRODUCT DEMO

QUESTION AND ANSWER

Future Work



LESSON LEARNED

- Learn and use some **useful software**.
- Know programing **Python**.
- **Planning** task, create Schedule.
- **Working in group**, find problem and resolve problem.


MINI EXPLORER
THANK YOU