Project 1 :Smart Home
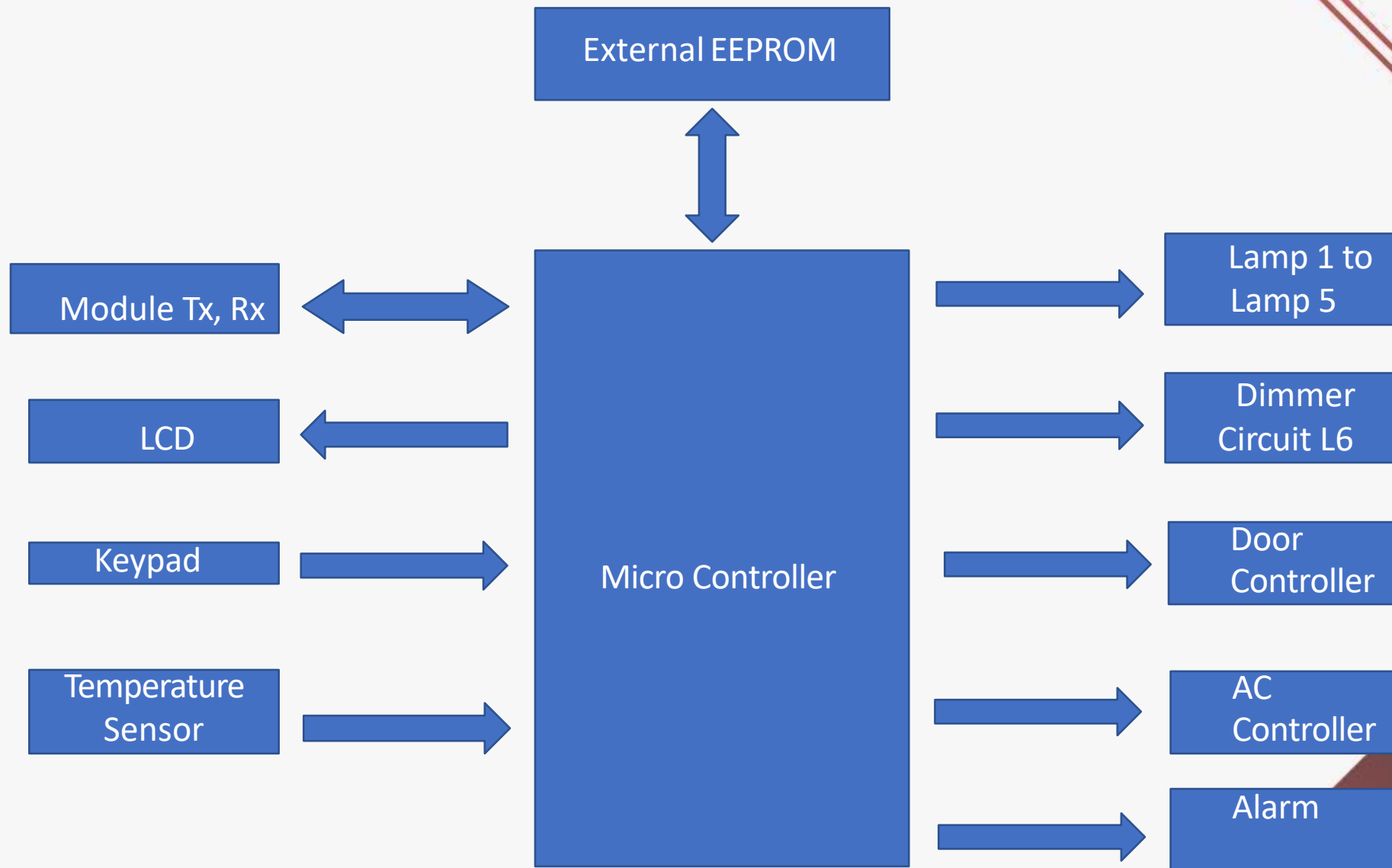
- it is a popular project nowadays, it is a very comfortable application for humans, it aims to convert any thing around to be controllable and smart.
- At the following we have some requirement to implement smart home application:

  ❑ Remoted controlled by mobile or lab top.
  ❑ For emergency cases or controlling without mobile or lap-top use LCD and Keypad "user mode only".
  ❑ The controllable things are 6 lamps "5 on/off lamps, one dimming lamp", door, air-condition according to the ambient temperature.

- ❑ Login system admin and user "admin is remoted only".
- ❑ Admin mode can register any user or remove.
- ❑ Usernames and password must be kept into memory even if the system is powered off.
- ❑ If admin or any user or passwords are entered wrong more than 3 trial, the system must break down and fire alarm until reset.
- ❑ Admin and user can access to all applies except user cannot control the door opening.

Specifications –LCD& keypad

1. They are used to login to system as a user only.
2. After login, user can control all features except opening door.
3. They can control the system even if any user login by remoted mode except admin until allowing of admin.
4. The interfacing of LCD must display the running devices if the keypad-LCD system is not used.
5. The user's usernames in this system different than the user's usernames in the remoting system.

Specifications –EEPROM

1. Storing the new user to the system "registration"..
2. It must be Read/write in admin mode.
3. It must be read only in user mode.

Specifications –TTL/Bluetooth

1. Transmitting/Receiving between MC and PC/mobile.
2. Every action, Message must be printed on Mobile/PC screen, like:
   Hey, please Enter your username:.
3. Transmitting/Receiving the commands to run the system.

Specifications –Lamps, Relay, Dimmer

1. Lamps must be isolated because of high power.
2. Dimmer is a circuit that can control on the current flow to lamp depending on the input voltage "0 – 5V".

Specifications –Temperature Sensor, DC motor

1. Temperature sensor reads the ambient temperature, if the temperature is higher than 28 °C, Air condition must be run "DC motor", if the temperature becomes lower than 21 °C, Air condition must be turned off "DC motor"

Specifications – Door

1. The actuator used is a servo motor to control the opening door only in admin mode, it is controlled by command which is send by Mobile/PC "Open\Close the door"

Component you may need

1. 24C08 EEPROM, or use the internal.
2. Bluetooth module HC-05 or TTL (PL2003 or CH340or CP2102).
3. 5 transistors and relays (Not mandatory they can be replaced by LEDs.
4. 1 transistor and Solid-state Relay for dimming circuit.
5. LM35 temperature sensor or equivalent.
6. 2 NPN and DC motor
7. Keypad & Lm01602A Character LCD.
8. Servo motor.

Team Members:

Team members must not exceed Six members.

It can be built by hardware or simulation.

Project 2:Electric Water Heater
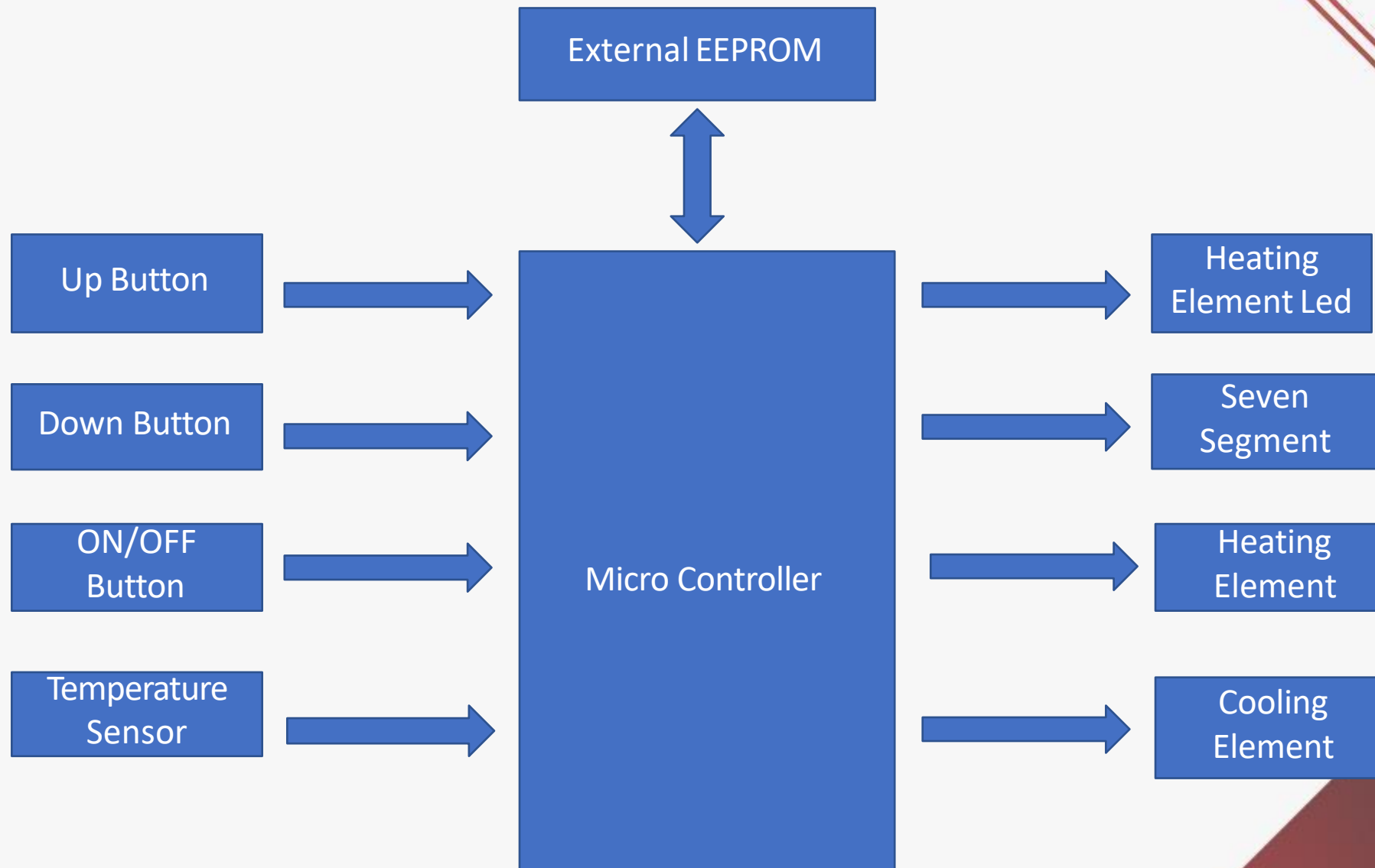
- **Specifications –Temperature Setting**

1. The "Up" or "Down" buttons are used to change the required water temperature (set temperature).
2. The first "Up" or "Down" button press, enters the temperature setting mode.
3. After entering temperature setting mode, a single "Up" button press increase the set temperature by 5 degrees.
4. After entering temperature setting mode, a single "Down" button press decrease the set temperature by 5 degrees.
5. The minimum possible set temperature is 35 degrees.
6. The maximum possible set temperature is 75 degrees.
7. The "External E2PROM" should save the set temperature once set.
8. If the electric water heater is turned OFF then ON, the stored set temperature should be retrieved from the "External E2PROM".
9. The initial set temperature is 60 degrees.

- **Specifications –ON/OFF Behavior**

1. If power is connected to the heater, the electric water heater is in OFF state.

2. If the "ON/OFF" button is released and the electric water heater is in OFF state, the electric water heater goes to ON state.

3. If the "ON/OFF" button is released and the electric water heater is in ON state, the electric water heater goes to OFF state.

4. In the OFF state, all display should be turned OFF.

- **Specifications –Temperature Sensing**
1. The temperature sensor measures the water temperature.
2. The water temperature should increase, if the "Heating Element" is ON.
3. The water temperature should decrease, if the "Cooling Element" is ON.
4. Temperature should be sensed once every 100 ms.
5. The decision to turn ON or OFF either the "Heating Element" or the "Cooling Element" based on the average of the last 10 temperature readings.

- **Specifications –Heating/Cooling Elements**
1. The "Heating Element" should be turned ON, if the current water temperature is less than the set temperature by 5 degrees.
2. The "Cooling Element" should be turned OFF, if the current water temperature is less than the set temperature by 5 degrees.
3. The "Heating Element" should be turned OFF, if the current water temperature is greater than the set temperature by 5 degrees.
4. The "Cooling Element" should be turned ON, if the current water temperature is greater than the set temperature by 5 degrees.

- **Specifications –Seven Segments**

1. Seven segment by default show the current water temperature or the set temperature.

2. By default, the 2 seven segment display are show the current water temperature.

3. If the electric water heater is in the temperature setting mode, the 2 seven segment displays should blink every 1 second and show the set temperature.

4. In the temperature setting mode, every change in the set temperature should be reflected on the 2 seven segment displays.

5. The 2 seven segment display should exit the temperature setting mode, if the "UP" and "Down" buttons are not pressed for 5 seconds.

- **Specifications –Heating Element Led**

1. If the "Heating Element" is ON, the "Heating Element Led" should blink every 1 second.

2. If the "Cooling Element" is OB, the "Heating Element Led" should be ON.
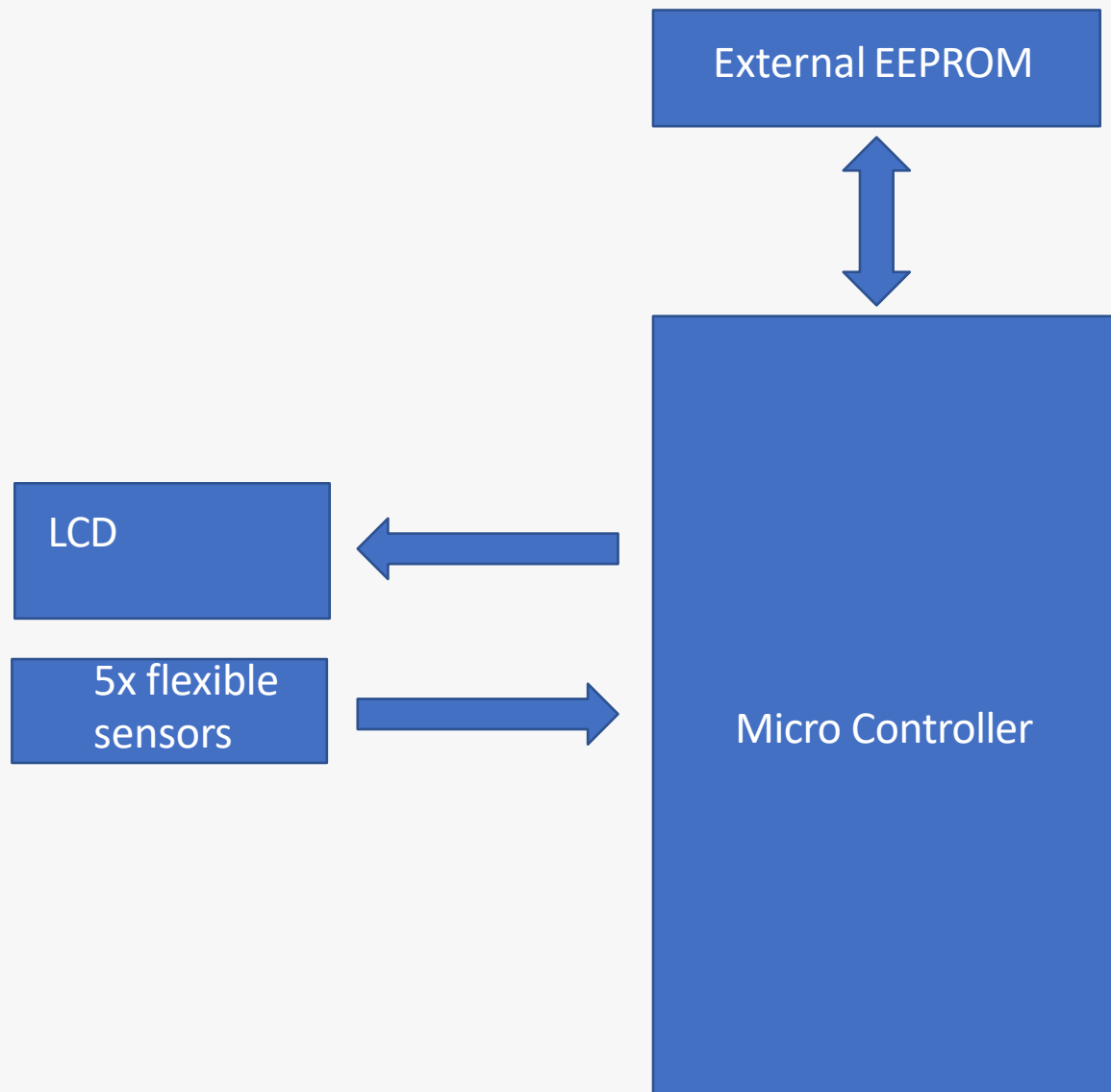
Component you may need

1. 24C08 EEPROM, or use the internal.
2. Temp sensor (LM35, or equivalent DS18B20).
3. Cooling Element (Peltier).
4. Heating Element (3d ceramic heater).
5. 7-segments.
6. LEDs.
7. Push Buttons.
8. Solid State Relays.
9. Cooling fins & fans.

Team Members:

Team members must not exceed Four members.

It can be built by hardware or simulation.

Project 3:Glove for Deaf

- Deaf use the sign language to be in touch with surrounding people, unfortunately, the people must learn or know the sign language to connect with them.

- So, we will implement a device that can transcript the sign word on LCD:
  - ❑ Five flexible sensors must be put on all fingers respectively.
  - ❑ Flexible sensors fast response detect any motion of fingers.
  - ❑ According to the posture of fingers, the relative meaning will be printing on the LCD.
  - ❑ The number of words must be transcript must not be less than fifteen words.
    - ❑ Old word will be cleared if a new word is activated.

Specifications –Flexible sensors

1. They are used to detect any motion of fingers, every finger must has an individually one.
2. According to the position of pack of fingers, the relative word will be printed on LCD.

Examples

Component you may need
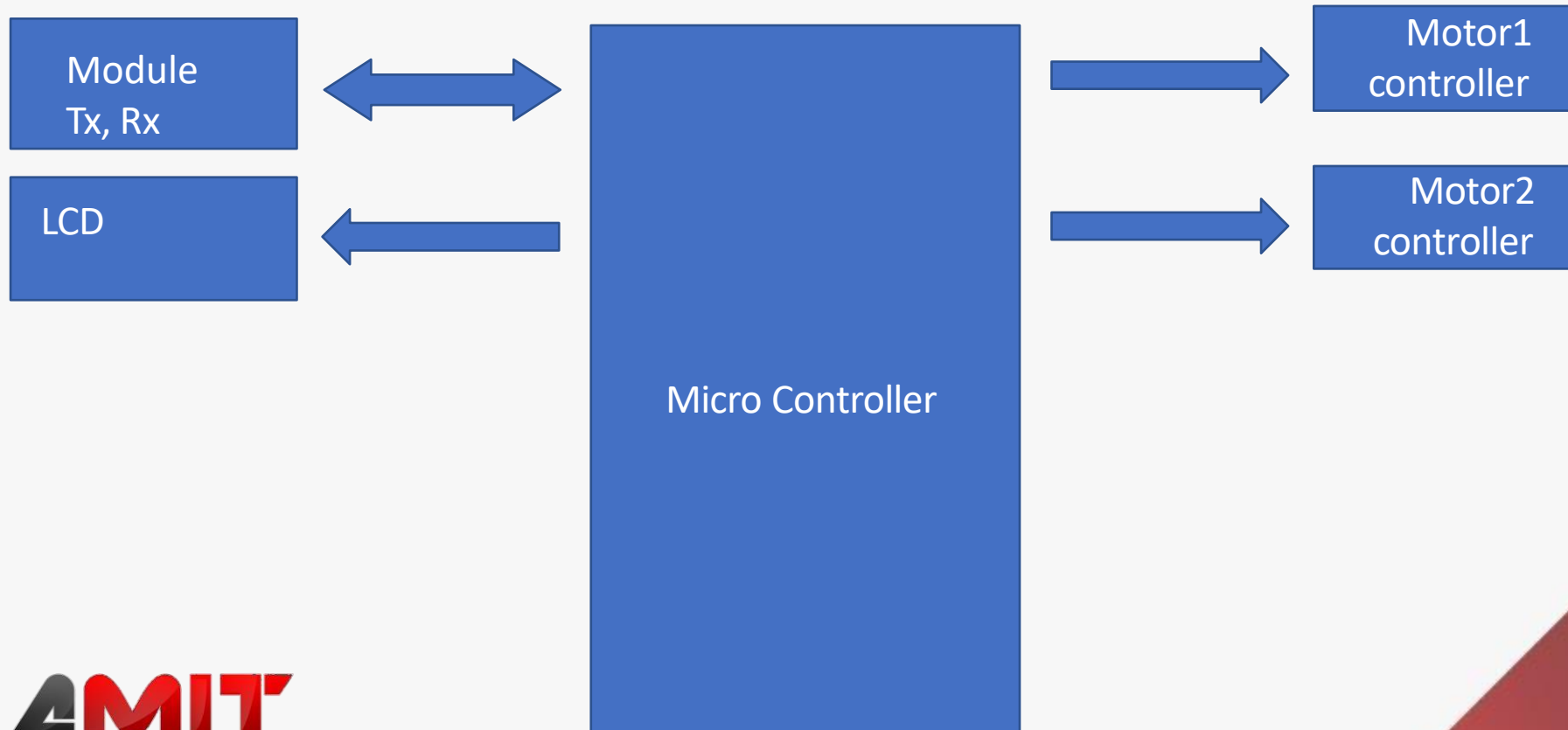
1. 5x flexible sensor.
2. Gloves.
3. Wires.
4. LCD.

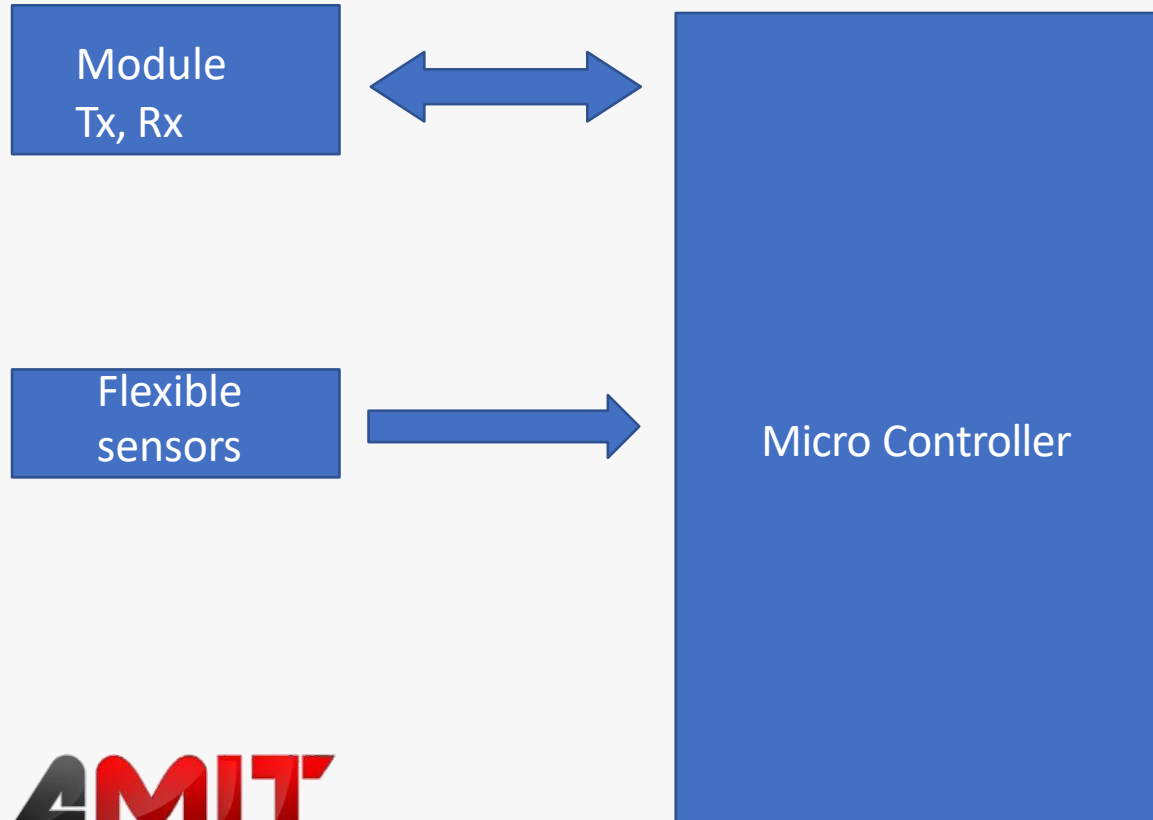# Team Members:

Team members must not exceed Three members.

It must be built by hardware only.

Project 4 : Controlling Car with hand motion

Car Module:

Hand Module:

- This project aims to control a car direction and speed using hand motion or finger motion:

  ❑ Hand Module must fast responsive detect the posture of fingers.
  ❑ Then, the controller of hand must send the updating of finger posture.
  ❑ According to the finger posture, the car will move.
  ❑ Thumb posture controls the speed of motors.

Specifications –Flexible Sensor, BT module

1. They are used to detect any motion of fingers, every finger must has an individually one.
2. According to the position of pack of fingers, the relative motion of motors will be sent to the module of car.

Specifications –L293D, BT module, LCD

1. BT module after receiving the fingers' posture, L293D must activate the motor direction.

2. LCD displays the current direction that car immediately move.
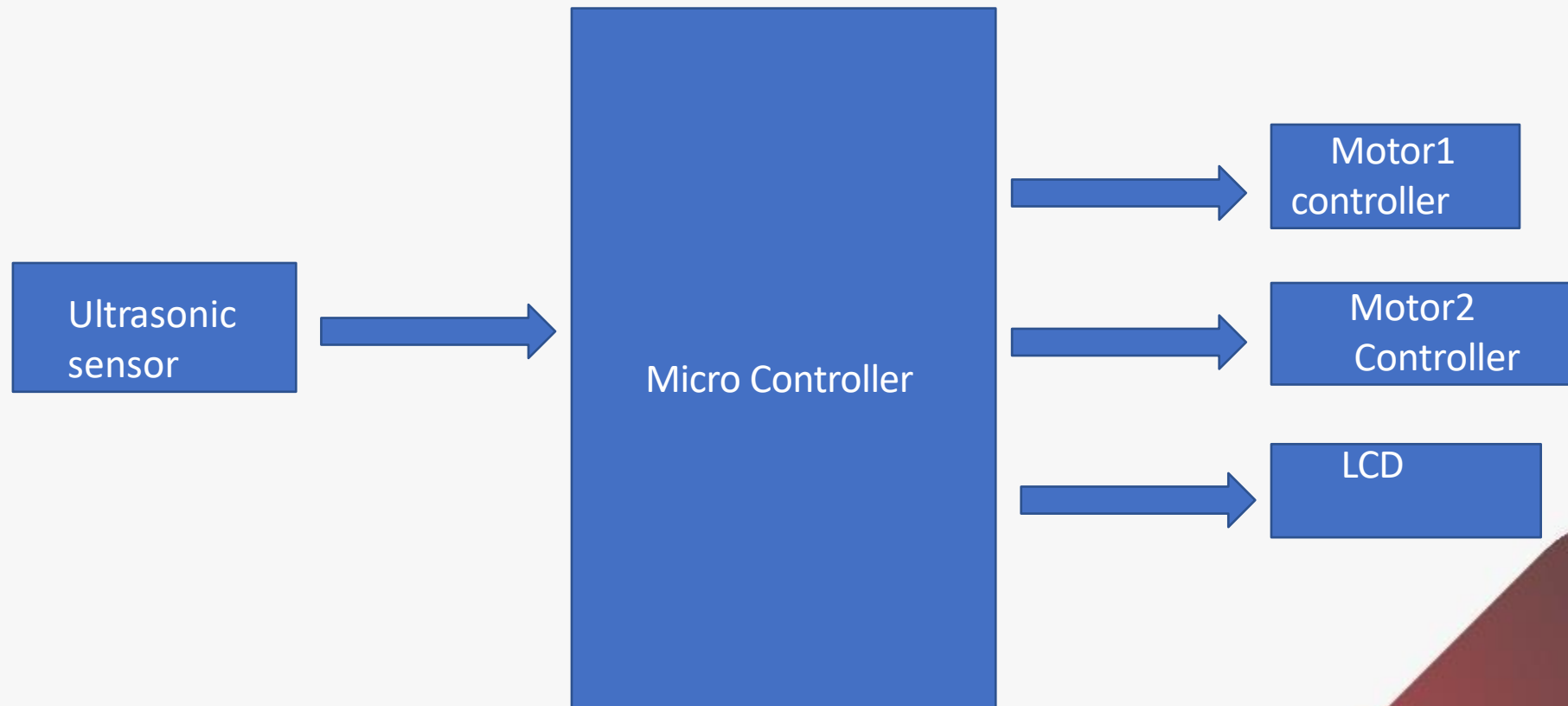
Component you may need

1. ATMEGAxx or ATTINYxx for hand module.
2. 5x flexible sensor.
3. Gloves && Wires.
4. 2x Battery 3.7 V.
5. LM7805 voltage regulator, 2x 22uf capacitor. 6.
   2x HC-05.
7. L293D.
8. Motors.
9. Caster wheel.
10. Chassis

Team Members:

Team members must not exceed Five members.

It must be built by hardware only.

Project 5 : Autonomous Car

- This project aims to implement a self-driving Car that can avoid the obstacles with very fast response:

  ❑ Ultrasonic is placed on servo motor axis, its function to detect the obstacles on the car way.
  ❑ If the car found an obstacle, it must change its way according to the ultrasonic data

Specifications –ultrasonic Sensor, L293D, LCD, Servo

1. Ultrasonic is used to detect any obstacles towards to the car, and the car must fast react to avoid this obstacle like stopping and turning to any empty direction.

2. L293D is used to control the speed and the direction of motors.

3. LCD displays the current direction that car immediately move.

4. Servo is used to make ultrasonic scanning around 180°.
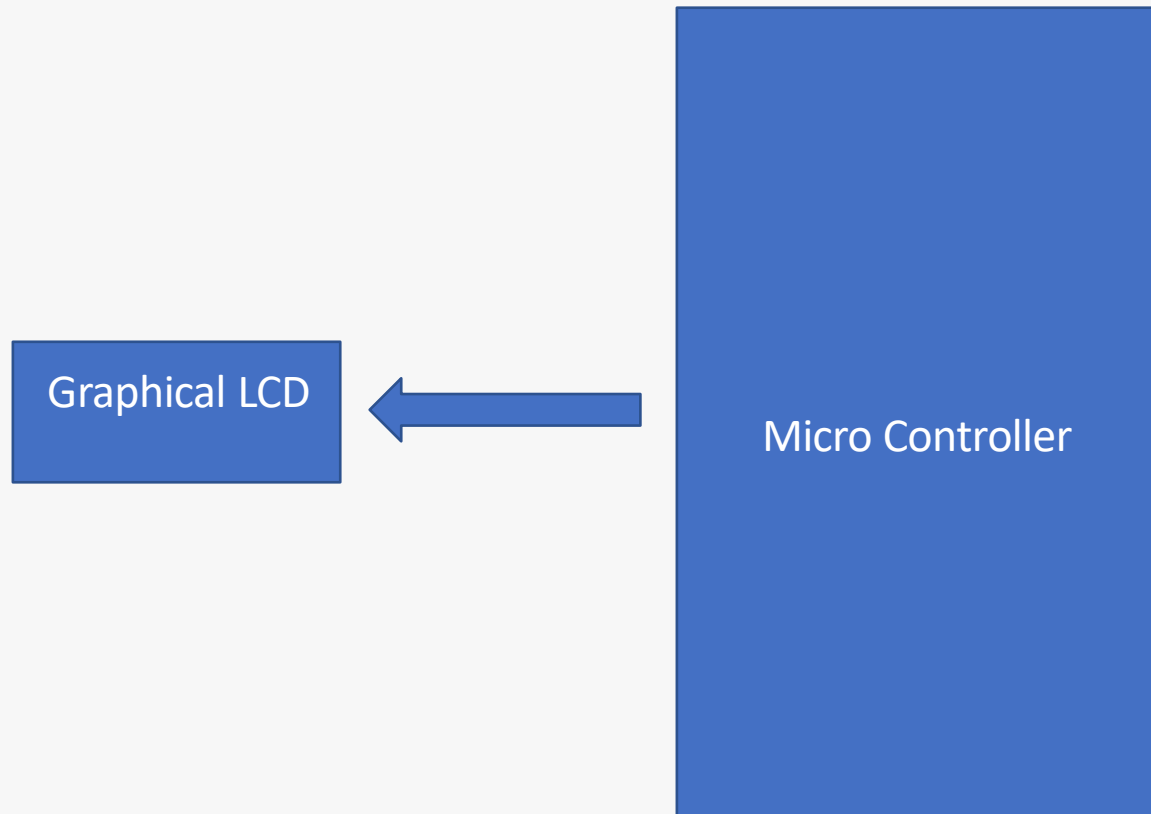
Component you may need

1. Ultrasonic HC- SR04.
2. Servo motor.
3. L293D.
4. Motors.
5. Caster wheel.
6. Chassis

Team Members:

Team members must not exceed Four members.
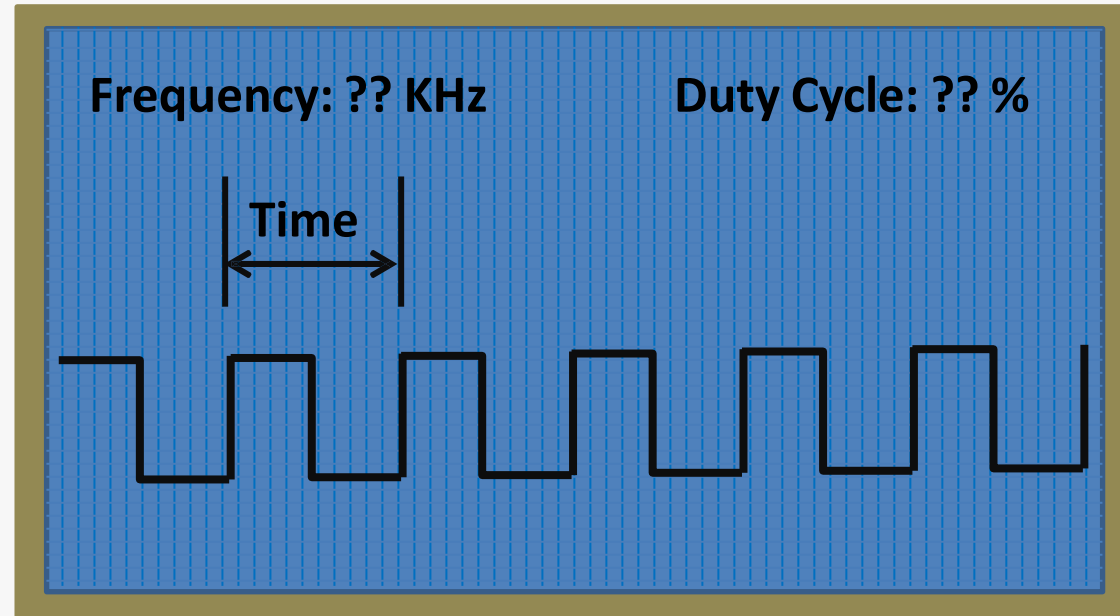

It must be built by hardware only.

PWM Drawer

- **Description – PWM drawer:**
  - ❑ PWM drawer works as a mini oscilloscope that is responsible for printing the frequency and the waveform of the generated PWM signal.
  - ❑ The generated wave came from two sources, external sources (e.g. generated PWM from other MCs), or internal source of the Microcontroller of the project itself.

- **Specification – Graphical LCD:**
  - ❑ With the graphical LCD we can display the following:
    - The shape of the generated PWM from internally or externally sources.
    - The frequency in KHz of the generated wave on the upper left side of the LCD.
    - The duty cycle of the generated wave on the upper right side of the LCD.
    - The time of the single cycle.

Graphical LCD Review

Components you may need:

1. Micro-controller (ATmega32, or equivalent).
2. Graphical LCD.

Team Members:

Team members must not exceed one member.

It can be built by hardware or simulation.

THANK YOU!

AMIT
Beyond Education