Alexa Controlled Home Automation

SIMULATION OF AUTOMATIC OVERFLOW CONTROLLER

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99007621 | EMBEDDED SYSTEM DESIGN MODULE 2

Contents

(1) Alexa Controlled Home automation

This project aims to create a wireless system for managing typical household electrical gadgets, allowing for direct control. By connecting a home automation computer to a wireless network, home automation software often provides access to an interface to the home automation system. This project report, titled "Alexa controlled Home Automation," offers a complete discussion of home automation in general and the practical implementation that we performed in this project. We have discussed some of the most fundamental modules generally necessary for any home. These modules comprise lighting control, curtain control, fan control, gate control, and security control of the house's outside. All required components and equipment are mentioned, along with a cost analysis, and a brief explanation of cost-effective implementation for a typical home is provided. Moving on, a quick overview of potential upgrades is offered to elevate this project to a higher level.

ii) Research
A home automation system makes the operations of various home appliances more convenient and saves energy. With the energy-saving concept, Smart home or building automation makes life very simple nowadays. It involves automatically controlling all electrical or electronic devices in homes or even remotely through wireless communication. Centralized control of lighting equipment, air conditioning and heating, audio/video systems, security systems, kitchen appliances, and all other equipment used in home systems is possible with this system.

2) Advantages
- Managing all of your home devices from one place.
- Flexibility for new devices and appliances.
- Maximizing home security.
- Remote control of home functions.
- Increased energy efficiency.
- Improved appliance functionality.
- Home management insights.

3) Dis advantages
- High installation costs.
- A reliable internet connection is crucial.
- Security issues.
- Technological problems in connected homes.
- Helplessness if technology fails.
- Some people may not like intelligent technologies.
- Maintenance and repair issues.

4) Cost and Features

- I am working on that!! Stay tuned, I will let you know very soon.!

5) Features

- Interoperability
- Remote Access
- Expandability
- Upgradeability
- Variety of User Interfaces
- Time-Tested
- Energy Management
- Layers of Protection
- Works for YOU

6) SWOT Analysis

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S
- Unique approach in-home appliance segment
- Wide range of product categories to cater to low, middle and high-income groups
- New to market

W
- Heavy reliance on short term debts
- Replacement issues.
- Product appearance and aesthetics

O
- Trending in market
- The home Appliances market is growing very fast
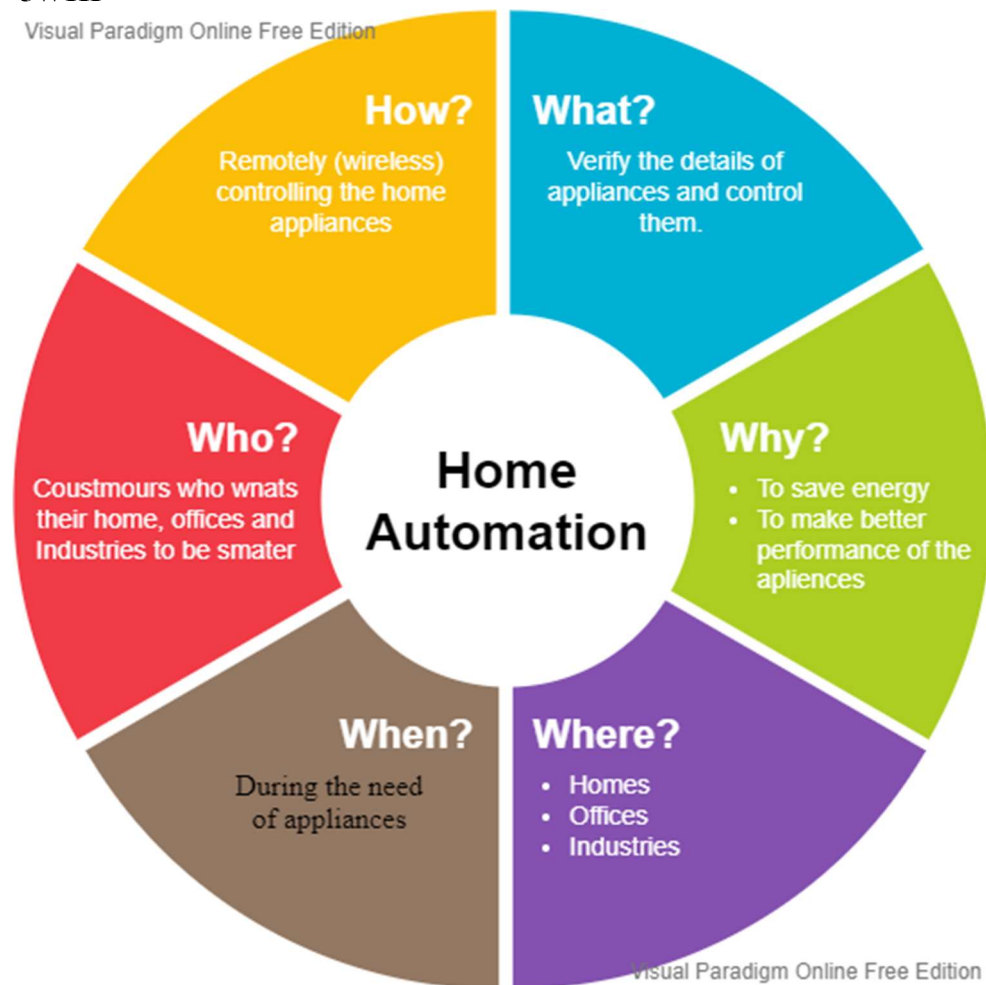- Opportunities to launch new products

T
- Price wars with closest competitors
- Competition from companies along with new entrants
- Exposure to cyclicality and volatility of industry

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7) 5W1H

How?
Remotely (wireless) controlling the home appliances

What?
Verify the details of appliances and control them.

Who?
Coustmours who wnats their home, offices and Industries to be smater

Home Automation

Why?
- To save energy
- To make better performance of the apliences

When?
During the need of appliances

Where?
- Homes
- Offices
- Industries

Requirements

1) High-level requirement

ID	Description
HLR01	The system should be able to access the appliances when the person in the home
HLR02	Users should be able to access the appliances
HLR03	The system should recognize owned devices/appliances
HLR04	OTP generated verification for user
HLR05	The system should recognize the invalid user
HLR06	The system should control over voice
HLR07	The system should connect with Amazon Alexa
HLR08	Display the water-level present in the tank
HLR09	Switch on the water pump when the water level is low in the tank
HLR10	Switch off the water pump when water is filled in the tank

2) Low-Level Requirements

ID	Description
LLR01	Only if the person is inside the home then the only device must be on
LLR02	full list of appliances

ID	Description
LLR03	status of appliances
LLR04	Present device/appliances must be tracked
LLR05	the system should recognize the voice commands
LLR06	Display the water level in terms of liter
LLR07	Display the water level based on the sensor's input
LLR08	Switch on the water pump when both the water-level sensors are open

3) Hardware Components Required

Amazon Alexa echo dot

i. ATMEL ATMEGA 16 (an AVR based microcontroller)

8-bit microcontroller – ATmega16 is a high-performance microcontroller and it can process 8-bit data at a time. It takes 8 bits of data from memory. And utilize low power consumption. Its architecture is based on enhanced RISC architecture.

ii. PIR sensor

Passive infrared sensors A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications.

iii. Stepper motors

A stepper motor, also known as a step motor or stepping motor, is a brushless DC electric motor that divides a full rotation into several equal steps.

iv. LCD

is a flat-panel display or another electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly

v. *Proximity sensor*

A proximity sensor is a non-contact sensor that detects the presence of an object (often referred to as the "target") when the target enters the sensor's field. Depending on the type of proximity sensor, sound, light, infrared radiation (IR), or electromagnetic fields may be utilized by the sensor to detect a target. Proximity sensors are used in phones, recycling plants, self-driving cars, anti-aircraft systems, and assembly lines. There are many types of proximity sensors, and they each sense targets in distinct ways.

vi. *Motor driving IC*

A motor driver IC is an integrated circuit chip that is usually used to control motors in autonomous robots. Motor driver ICs act as an interface between microprocessors in robots and the motors in the robot.

vii. *Power supply requirements*

viii. Transformers (step down)

A step-down transformer is a type of transformer that converts the high voltage (HV) and low current from the primary side of the transformer to the low voltage (LV) and high current

value on the secondary side of the transformer. The reverse of this is known as a step-up transformer

I.   Diode bridges (500 mA,1A)

A diode bridge uses diodes as series components to allow current to pass in the forward direction during the positive part of the AC cycle and as shunt components to redirect current flowing in the reverse direction during the negative part of the AC cycle to the opposite rails.

II.   Capacitors filter

A capacitor that is used to filter out a certain frequency otherwise series of frequencies from an electronic circuit is known as the filter capacitor.

III.   Voltage regulators

A voltage regulator is a circuit that creates and maintains a fixed output voltage, irrespective of changes to the input voltage or load conditions. Voltage regulators (VRs) keep the voltages from a power supply within a range that is compatible with the other electrical components.

IV.   Small heat sinks

V.   LEDs

A light-emitting diode is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons

VI.   Switches

A switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another
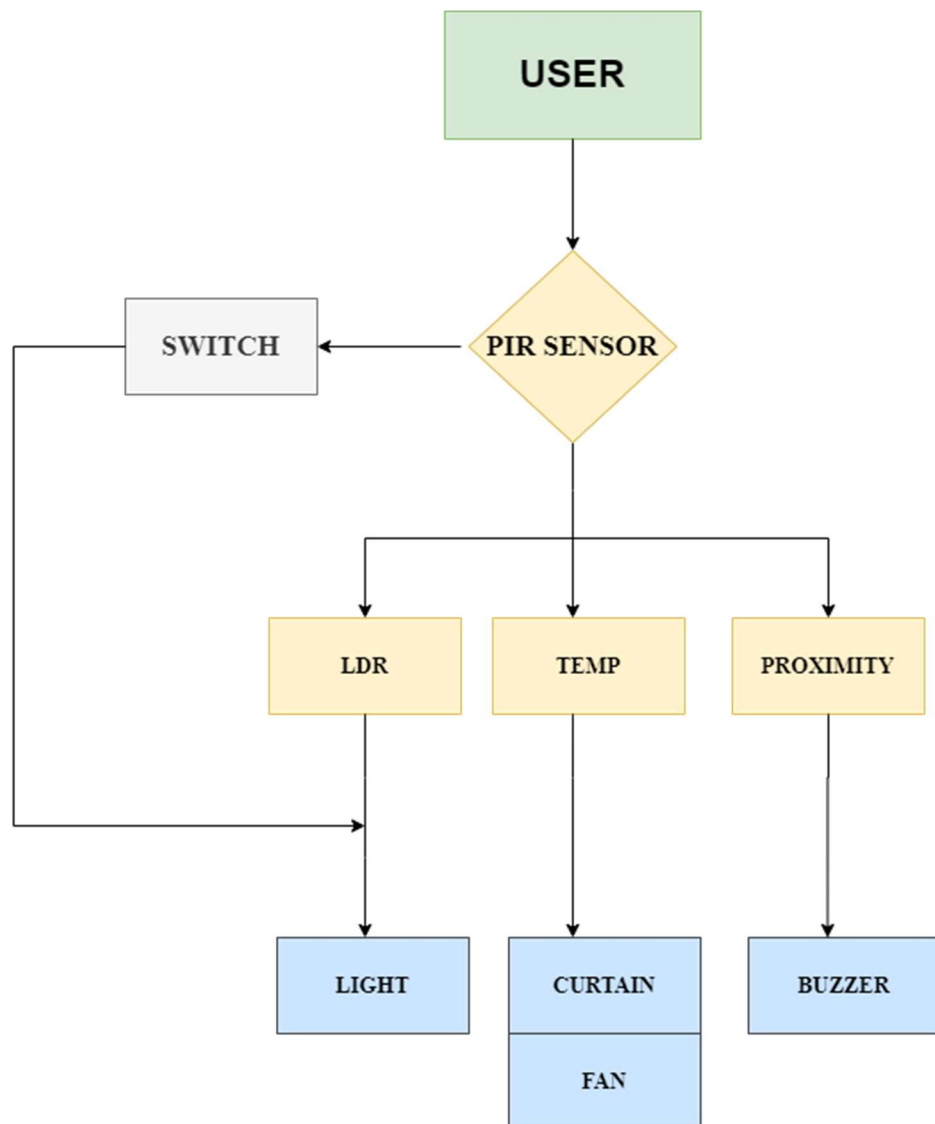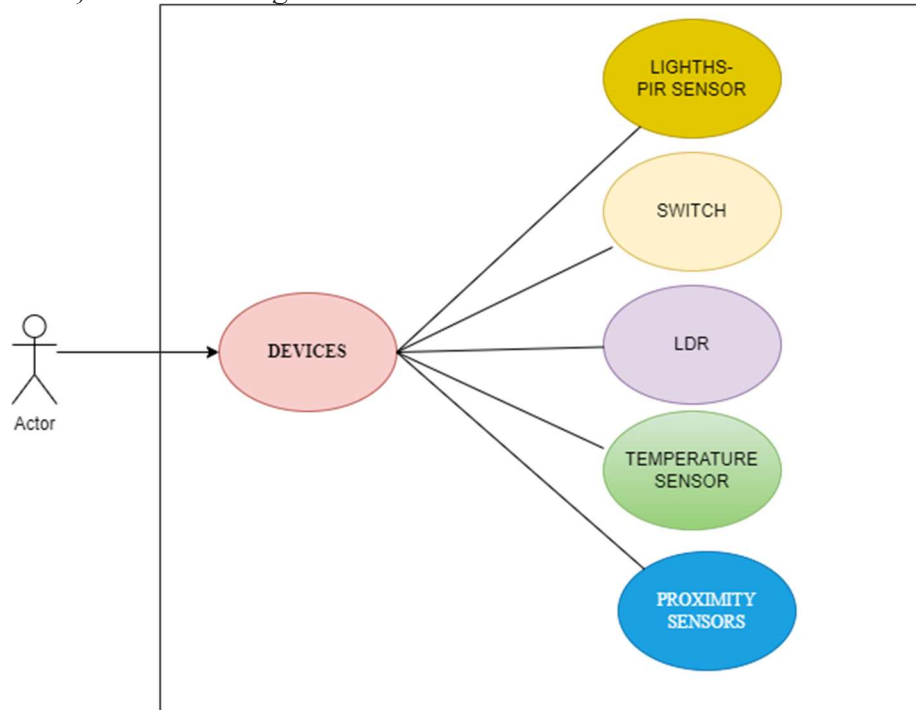
Connecting wires

VII.   LDRs

Light-dependent resistors, LDRs, or photoresistors are electronic components that are used to detect light & change the operation of a circuit dependent upon the light levels.
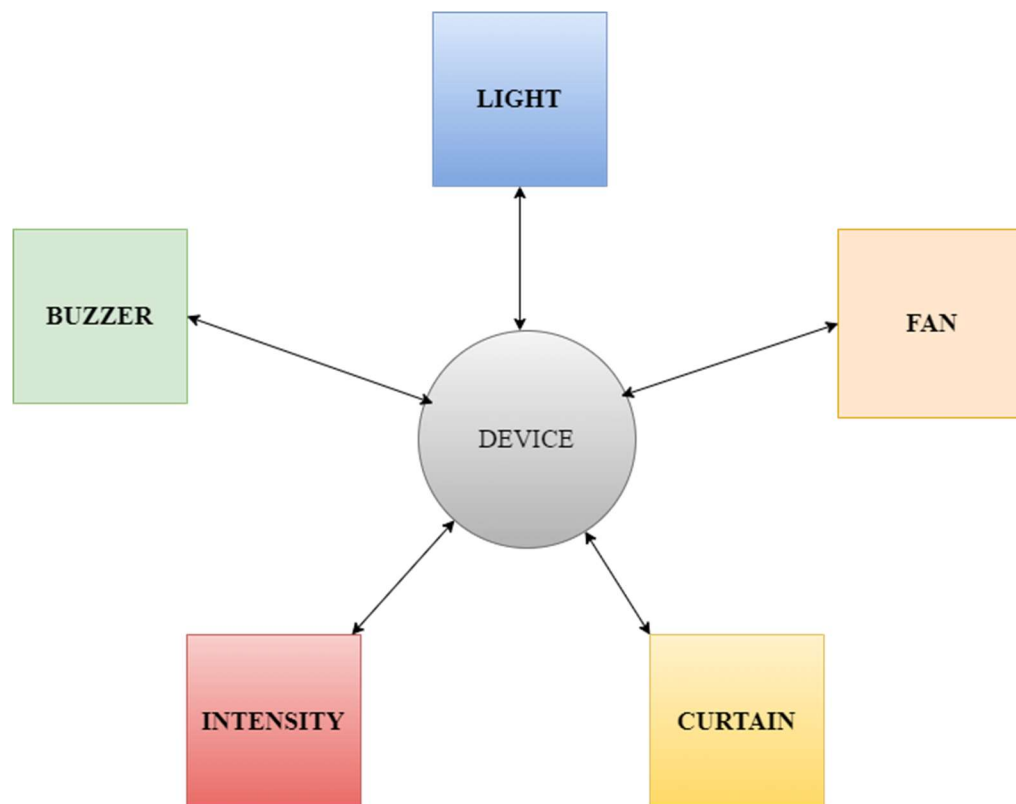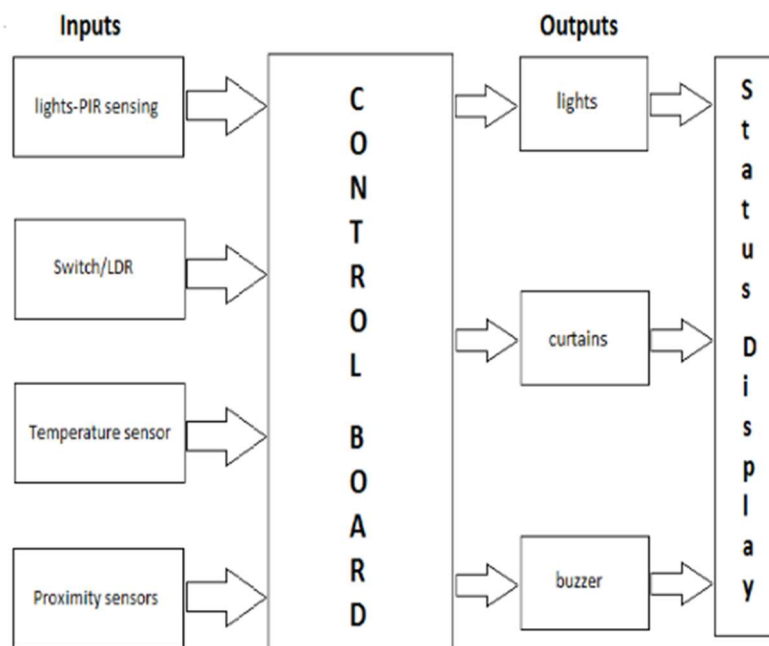
4) Architecture

- Flow Chart

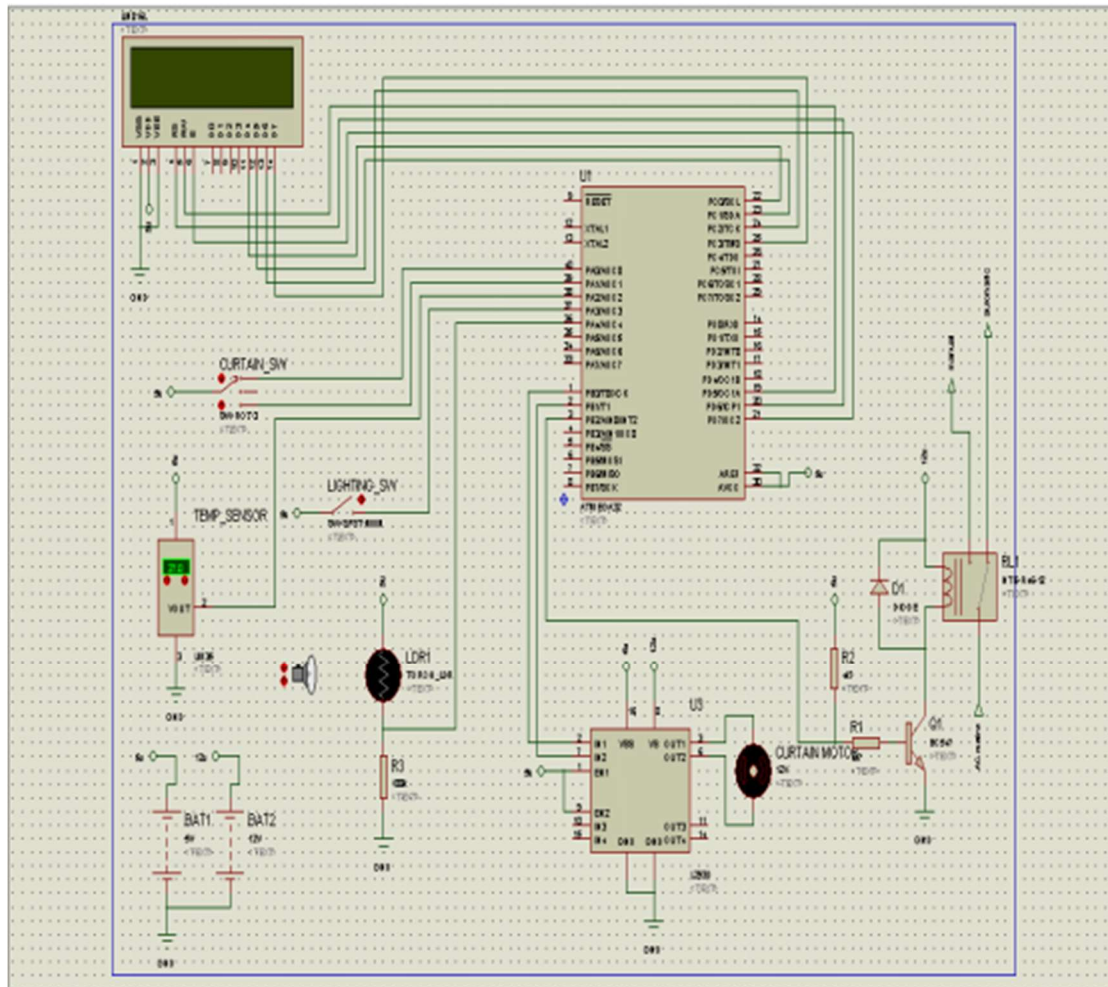## 2) USE case Diagram

3) Flow Diagram

4) Block Diagram

5) Circuit Design and Simulation

- **Home Automation** (Full circuit in Proteus, Because Lots of Limitations in the SimulIDE)

2) SIMULIDE Simulation

HOME AUTOMATION SYSTEM / WATER LEVEL AND OVERFLOW CONTROLLER OF OVERHEAD TANK

Over Head Tank
1000 liters

WATER LEVEL INDICATOR

WATER LEVEL SENSOR

WATER LEVEL SENSOR

MOTOR
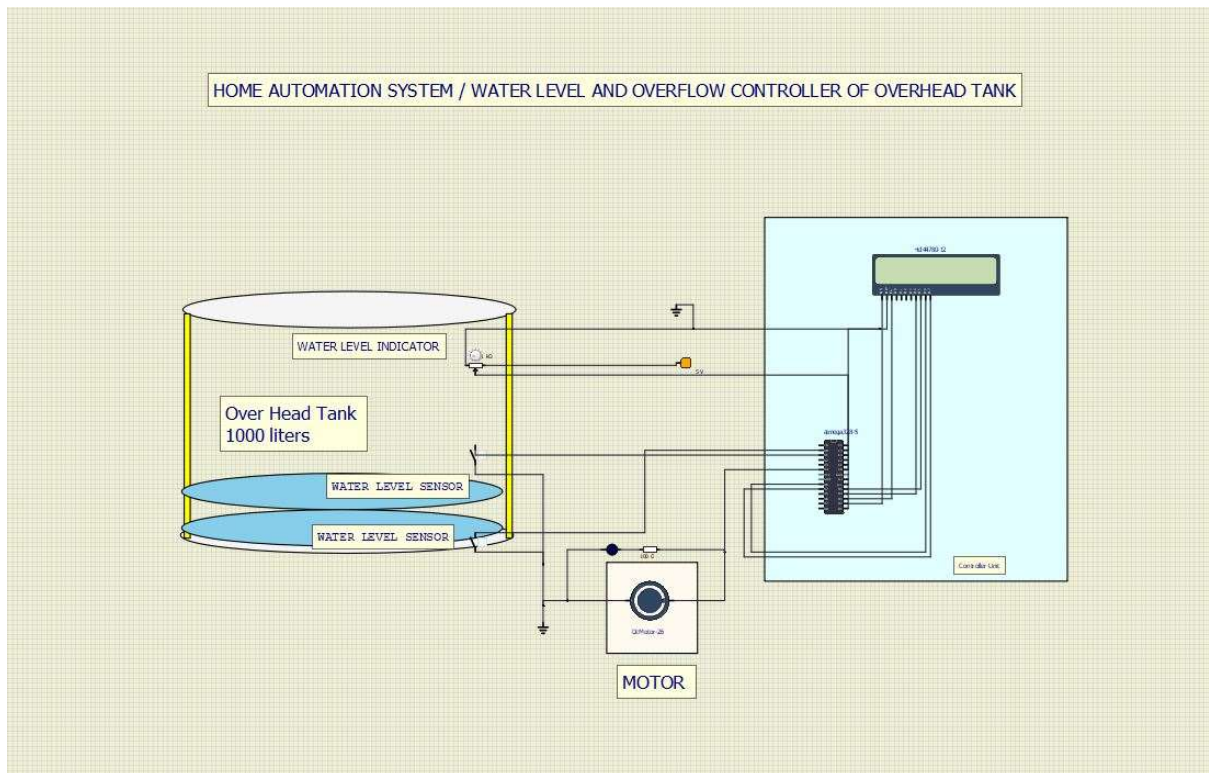
Due to lots of Limitations, I have only Implemented One function of Home automation, but the research is carried out for the Overall home automation project

7) **Test plan and Output**

- **High-Level Requirements**

ID	Description	Exp I/P	Exp O/P	Actual o/P	Type of Test
HLR01	The system should be able to access the appliances when the person in the home	Valid	Matched	Passed	Requirement Based
HLR02	Users should be able to access the appliances	Valid	Matched	Passed	Requirement Based
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- **Low-Level Requirement**

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8) Applications

- This system can be used in overhead water tanks in the house.
- This system can be used in offices and industries.
- This application can be used where customers want their homes and offices to be smart.

9) Learnings

- Learned to design the best circuits in SimulIDE
- Learned Embedded development life cycle
- Conducted Research on multiple Embedded systems
- Embedded C in Visual Studio

10) Challenges Faced

- Due to lots of Limitations of Sensors, Modules, actuators in the **SimulIDE**, we have Just Implemented one part of the Home automation. Use Switches as Sensors and Potentioon Meter as Analog sensors
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