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ADVANCE CONTROLLING OF SMART COLONY USING PLC AND SCADA

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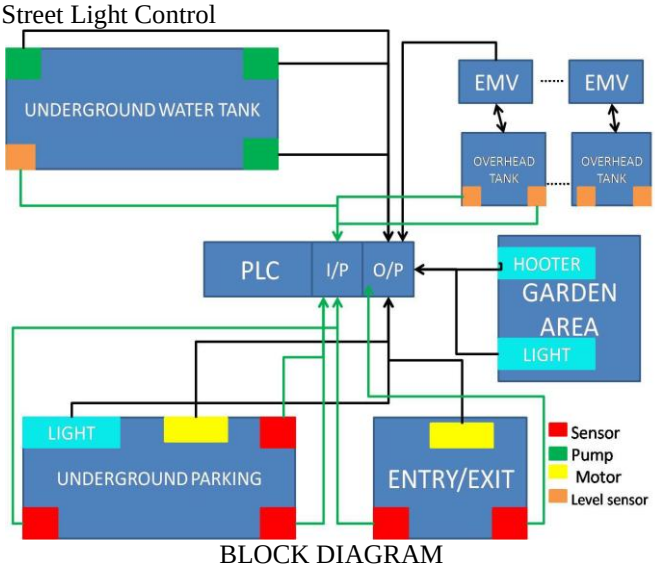
ABSTRACT: Colony of our society is important for us. So we need to secure and modify colony. By this project we can control our colony with smartness. Our project is based on concept of automation in which we control the entry-exit, water management, parking etc.
KEYWORDS: Automation ,PLC, SCADA, water level sensors

I. INTRODUCTION

In the recent developments that are taking place in the world nowadays. The concept of smart city is very widely discussed by the innovators as well as the world leaders. Smart city is basically a planned city which will make the life of the citizens easy to live a quality life. Now the basic idea is that we are discussing a smart city for dumb people. So for a smart city the basic idea is to make everything smart from a small pin to an airplane. Smart colony is a major building block for the smart city that all the world leaders and innovators discuss. So in this project we try to implement and study the basic building blocks and basic parameters that are used in the smart colony. The basic parameters that are a problem in the current colony will be solved in the first version of this smart colony. The problem was the following parameters which can be enhanced and innovated further.

Main entry exit control
Underground parking
Water Supply Management
Gardening Control
Street Light Control



BLOCK DIAGRAM

II. MOTIVATION

Despite the current developments in the future of smart colonies by the developers the problem of fully automation exists. So the developers are searching and developing a way of fully automated distributed control system which can be operated for years without any supervision. So this was the basic motivation behind us for choosing this title for further development.

III. IMPLIMENTATION

PLC (Programmable Logic Controller)

The PLC is used to run a program written on the programming language supported by that PLC. We are using a PLC by Siemens so the programming software will be TIA portal and the language supported by it will be Ladder, Functional Block as well STL. Now when we started implementation of the program on the TIA portal using virtual memory. Some of the thing we needed to take in account were the limitations of the input and output ports. Now after writing the programme in Ladder language in the TIA portal we had to upload the digital logic on the CPU of the PLC using PROFINET. The program was uploaded and also checked using toggle switches.

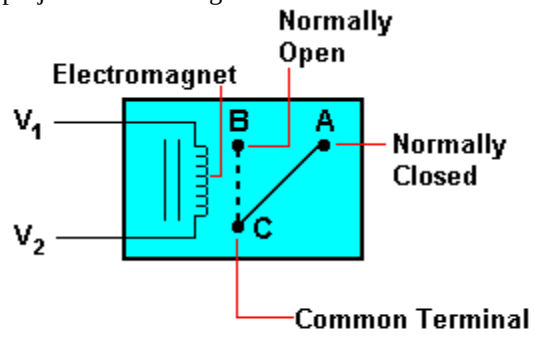
Component name	Specifications
PLC S7 200 Smart	CPU ST20, 12 Input, 8 Output 24V Dc
I/O Module	EM DT16, 8Digital input, 8Digital Output
SMPS	24V 5 Amp DC Output , 5V 5 Amp DC Output
Relay Card	24v Coil, 8 Output , 5v Coil, 8 Output
DC Motor	5V Dc
Electro Magnetic Flow Control Valve	24V Dc
Level Sensors	5V
Capacitive Sensors	5V
LED	3.3V

SMPS (Switched Mode Power Supply)

The SMPS is used to give power to the different Input and output sensors. Some sensor we have used work on the 5V power supply and some work on 24V power supply. Now in order to make them work properly without any lag power supply needs to be proper in order to avoid the over powering or under powering the components.

Relay Card

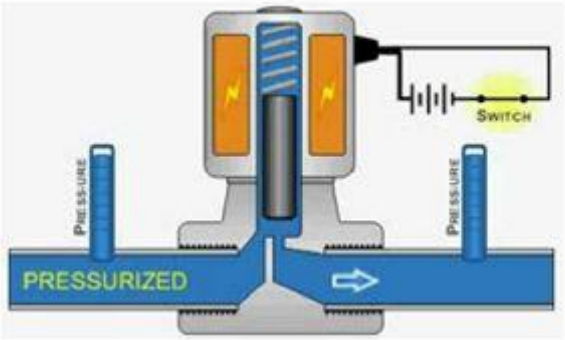
The different types of relay available in the market are 5V and 24V relay. There are three basic uses of relay. They are:- 1.On/Off Control 2. Limit Control 3. Logic Operation. In our project we use the Relay for On/Off Control as well as Logic Operation. The program logic is written in such a way that when the logic is executed properly then the relay will go on. The Relay used in this project is made by the team members of the project and not bought from outside.



SPDT Relay

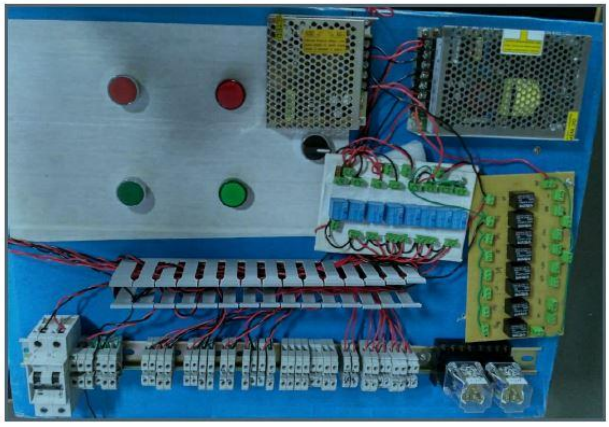
Solenoid Valve

The solenoid valve basically generates a pressure using electromagnetic field. So when the water reaches the solenoid valve the water will be sucked in and water will be released from the other side.



SOLENOID VALVE

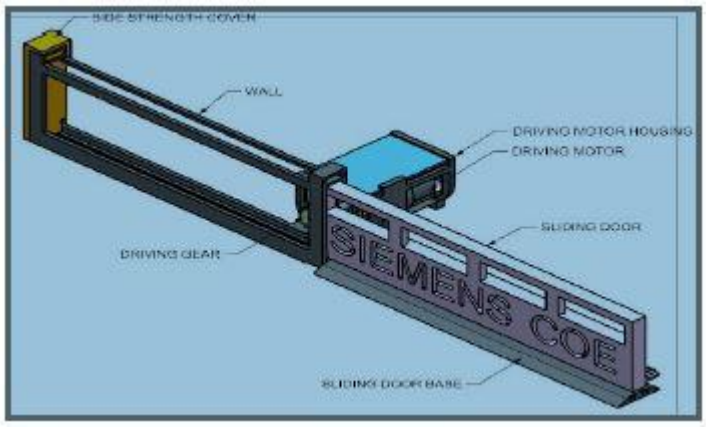
CONTROL PANEL



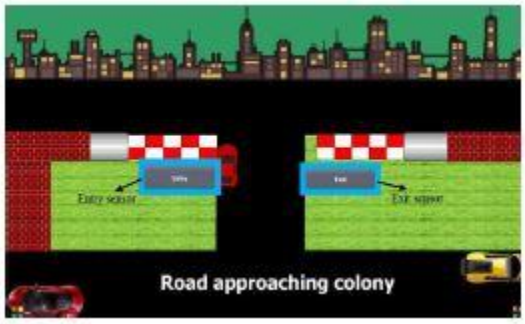
PROGRESS

Main Entry Exit

Now in any colony for visiting purpose also entry exit is needed. As per our problem statement we have decided to design an automated entry exit control system. This system will sense the entry of any type of vehicle using the inductive sensor at both side of the gates. Now the inductive sensor will give the detected input to the PLC I/O module. Afterwards the PLC will process the input and give the respective command to motor of the gate.



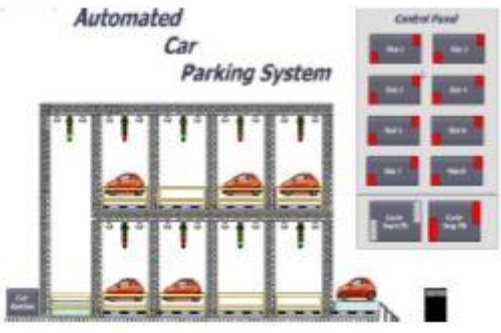
ACTUAL GATE OF ENTRY-EXIT



SIMULATION

Parking

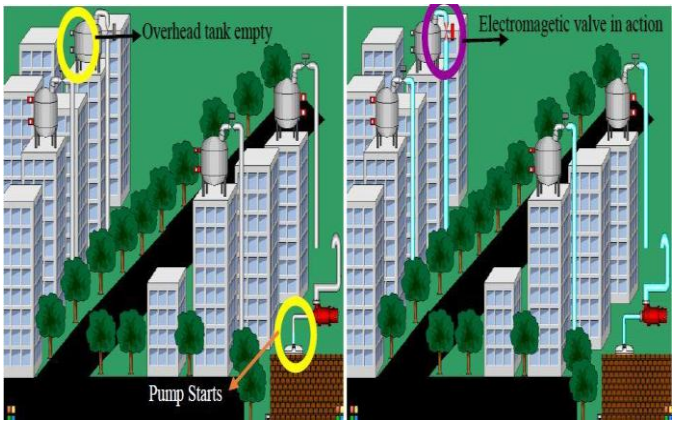
The basic problem of vehicle parking in big colonies is solved up to a certain extent by this idea. In the block of underground parking there is same design of logic as our entry exit gate block. The change is the opening and closing mechanism of the gate used for underground parking space. We have used a basic FLIP mechanism for the gate. In the conventional underground parking the problem of lighting was also faced. The lights used were required to be kept continuously powered up. Instead of the conventional idea we are controlling the underground lights by any human interference or vehicle interference using different type of sensor



SIMULATION OF CAR PARKING SYSTEM

Water Management System

Regularly water overflow problems are faced in colonies and societies. Now to overcome this problem we have decided to make a robust system which comprises of high low level sensors to overcome the conventional problem. Now in the above block diagram there are two systems one is for underground main tank and other is for overhead tank for each house or flat.



IV. CONCLUSION AND FUTURE SCOPE

In this project we learned about the various aspects of interdisciplinary project of two different branches of engineering, Electronics & communication and Instrumentation & control. We learned about the advanced aspect of PLC (Programmable Logic Controller) which is widely used in the industry. Some of the aspects covered were CAD design, NX Design as well as 3-D printing. The Real time programming on PLC. We also learned about Input output module and its interfacing with the relay as well as other sensors both of 5V and 24V. We learned interfacing and implementation of different types of components such a magnetic flow sensor, Electromagnetic valve, relay Card, capacitive and inductive sensor. The interfacing of a pump along with all the other components is a tedious task. The synchronization of all the components with or without real time clock is also an aspect learned. There are various more scopes for this project and can be implemented with more inputs from each and every side. Some are:

1. Data Metering
2. Switching of lights as per motion detection of vehicles
3. Remote troubleshooting of problems via static IP
4. Smart Dustbins on the street as well as at residences
5. Better waste collection and biodegradation system.

So after the implantation of the future scopes the result obtained will be as good as a product and so it can be converted from a pilot prototype to a product nearly ready to sell in the market.

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