Car Parking Monitoring Using PLC & SCADA

Harmeet Kaur, Himanshi Nigdikar, Kratika Mittal, Ajender Singh

***Abstract*— This document is based on industrial uses and for controlling procedure of manufacture in industries. In this we use *PLC* for controlling inputs and *SCADA*. Now these days PLC and SCADA is widely used in industries because of its electrical power standard by the using of PLC we can control outputs devices and can be able to operate automation by the programming in this module. This PLC module can work at both analog and digital inputs. So we can use digital/analog input in this PLC and working going on easily. We use here SCADA also by using of this we can supervising whole physical process in field at monitor and can also manually control from computer using SCADA. In this SCADA interface with PLC and both work by the synchronizing data and value from inputs to the PLC or PID.**

***Index Terms*— PLC (Programmable logic controllere); SCADA (Supervisory control & data acquisition); PID (Proportional integral derivative); ICS (Industrial control system); VCT (Volts center tapped); AC (Alternating current); LED (light-emitting diode).**

I. INTRODUCTION

A. *plc & scada*

A **programmable logic controller** (**PLC**) or **programmable controller** is a digital computer used for automation of electromechanicalprocesses, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory. A PLC is an example of a *hard* real time system since output results must be produced in response to input conditions within a limited time, otherwise unintended operation will result.

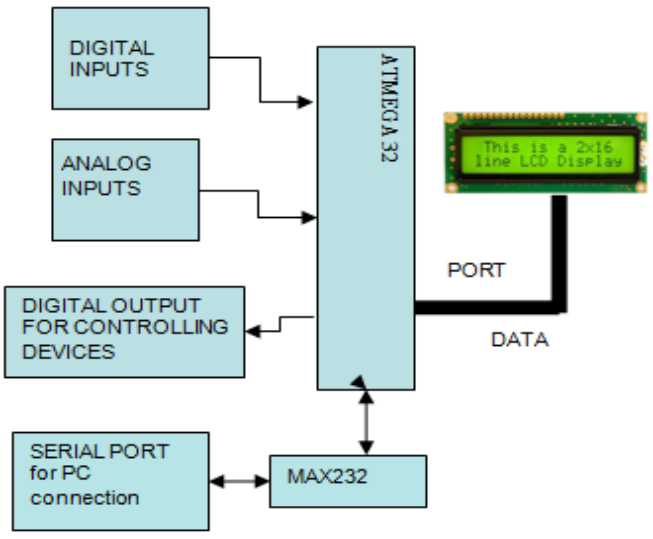
The main difference from other computers is that PLCs are armored for severe conditions (such as dust, moisture, heat, cold) and have the facility for extensive input/output (I/O) arrangements. These connect the PLC to sensors and actuators. PLCs read limit switches, analog process variables (such as temperature and pressure), and the positions of complex positioning systems. Some use machine vision. On the actuator side, PLCs operate electric motors, pneumatic or hydraulic cylinders, magnetic relays, solenoids, or analog outputs. The input/output arrangements may be built into a simple PLC, or the PLC may have external I/O modules attached to a computer network that plugs into the PLC.

B. *SCADA*

SCADA (supervisory control and data acquisition) is a type of industrial control system (ICS). Industrial control systems are computer controlled systems that monitor and control industrial processes that exist in the physical world. SCADA systems historically distinguish themselves from other ICS systems by being large scale processes that can include multiple sites, and large distances. These processes include industrial, infrastructure, and facility-based processes, as described below:

- Industrial processes include those of manufacturing, production, power generation, fabrication, and refining, and may run in continuous, batch, repetitive, or discrete modes.
- Infrastructure processes may be public or private, and include water treatment and distribution, wastewater collection and treatment, oil and gas pipelines, electrical power transmission and distribution, wind farms, civil defense siren systems, and large communication systems.
- Facility processes occur both in public facilities and private ones, including buildings, airports, ships, and space stations. They monitor and control heating, ventilation, and air conditioning systems (HVAC), access, and energy consumption.

• ARCHITECTURE



Harmeet Kaur, Department of Electronics and Instrumentation, Institute of Technology and Management Opp. to Sithouli Railway Station, NH-75 Jhansi Road, Gwalior, Madhya Pradesh, India
Himanshi Nigdikar, Department of Electronics and Instrumentation, Institute of Technology and Management Opp. to Sithouli Railway Station, NH-75 Jhansi Road, Gwalior, Madhya Pradesh, India
Kratika Mittal, Department of Electronics and Instrumentation, Institute of Technology and Management Opp. to Sithouli Railway Station, NH-75 Jhansi Road, Gwalior, Madhya Pradesh, India
Ajender Singh, Department of Electronics and Instrumentation, Institute of Technology and Management Opp. to Sithouli Railway Station, NH-75 Jhansi Road, Gwalior, Madhya Pradesh, India

II. ANALOG INPUTS

Analog inputs are those inputs which having variation in signal and different value at each sensiong point or intensity of sensing particals. Here in this type of sensing signal value is vary from lowest value of signal zero(0) to highest value of signal Vss (+5v)This types of signals are generally comes from sensors.

Here for analog signals inputs we use tempreture sensor (LM35) Precision Centigrade Temperature Sensors and some potentiometer.

A. LM35 sensor(Precision Centigrade Temperature Sensors)

The LM35 series are precision integrated-circuit temperaturesensors, whose output voltage is linearly proportional to theCelsius (Centigrade) temperature. The LM35 thus has anadvantage over linear temperature sensors calibrated in˚ Kelvin, as the user is not required to subtract a largeconstant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any externalcalibration or trimming to provide typical accuracies of ±1⁄4˚Cat room temperature and ±3⁄4˚C over a full −55 to +150˚Ctemperature range. Low cost is assured by trimming andcalibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration makeinterfacing to readout or control circuitry especially easy. Itcan be used with single power supplies, or with plus andminus supplies. As it draws only 60 µA from its supply, it hasvery low self-heating, less than 0.1˚C in still air. The LM35 israted to operate over a −55˚ to +150˚C temperature range,while the LM35C is rated for a −40˚ to +110˚C range (−10˚with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while theLM35C, LM35CA, and LM35D are also available in theplastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and aplastic TO-220 package.

III. DIGITAL INPUTS

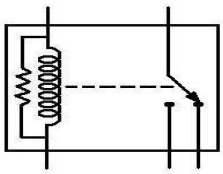
Digital inputs can be define as that which inputs those having in digital signal condition i.e. high or low, either Vs or V_E on other hand in binary form 1 or 0 these types of signal are known as digital inputs signals. These digital inputs are provide by digital sensor modules or switches.

Here we use for digital inputs some switches and ***IR sensor digital module*** which gives us a digital inputs to the controlling part of this project.

A. IR Module

In this we will see how to make simple infrared sensor module for detecting reflecting surface. This sensor can be used to detect reflecting silver/white strip, obstacle detection, flame detection, etc. These sensors are primary requirement of any simple line follower robocar.

B. 12V RELAY



A relay is a switch which is operated by electricity. It is usually electromagnetic device which has coil. When this coil is supplied with power, a magnetic field created and will operate mechanical switch. There are solid state relays which do not have moving parts but are very expensive compared to small mechanical relays. Pictures in this page shows typical small electro mechanical relay. Relay is used when we need to handle high voltages and currents through microcontroller operated system.

C. MAX232 IC

The **MAX232** is an integrated circuit, first created by Maxim Integrated Products, that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case. The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 VTTL levels. These receivers have a typical threshold of 1.3 V, and a typical hysteresis of 0.5 V. The later MAX232A is backwards compatible with the original MAX232 but may operate at higher baud rates and can use smaller external capacitors – 0.1 µF in place of the 1.0 µF capacitors used with the original device. The newer MAX3232 is also backwards compatible, but operates at a broader voltage range, from 3 to 5.5 V. Pin to pin compatible: ICL232, ST232, ADM232, HIN232.

IV. ATMEGA 32(MICROCONTROLLER)

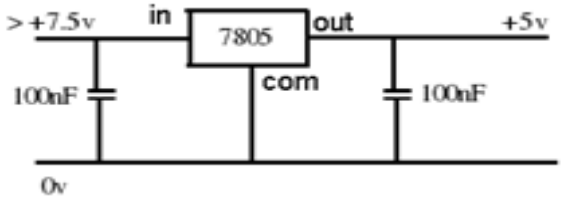
With ease-of-use, low power consumption, and high level of integration in mind, Atmel® AVR® 8- and 32-bit microcontrollers complement Atmel's ARM® microcontrollers and microprocessors to deliver a unique combination of performance, power efficiency and design flexibility. Optimized to speed time-to-market, they are based on the industry's most code-efficient architecture for C and assembly programming. No other microcontrollers deliver more computing performance with better power efficiency. Industry-leading development tools and design support let you get to market faster. Once there, the large AVR family lets you reuse your knowledge when improving your products and expanding to new markets—easily and cost-effectively.

A. *LED*

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices and are increasingly used for other lighting. When a light-emitting diode is forward biased (switched on), electrons are able to recombine with electron holes within the device, releasing energy the form of photons.This effect is called electro luminescence and the color of the light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductor. An LED is often small in area (less than 1 mm2), and integrated optical components may be used to shape its radiation pattern. LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. LEDs powerful enough for room lighting are relatively expensive and require more precise current and heat management than compact fluorescent lamp sources of comparable output.Appearing as practical electronic components in 1962, early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness.

B. *LM7805 Voltage Regulator +5V*

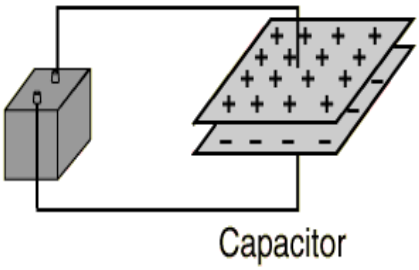
A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.



The 78xx (sometimes LM78xx) is a family of self-contained fixed linear voltage regulator integrated circuits. The 78xx family is commonly used in electronic circuits requiring a regulated power supply due to their ease-of-use and low cost. For ICs within the family, the *xx* is replaced with two digits, indicating the output voltage (for example, the 7805 has a 5 volt output, while the 7812 produces 12 volts). The 78xx line are positive voltage regulators: they produce a voltage that is positive relative to a common ground.

C. *Capacitor*

Capacitors are components that are used to store an electrical charge. Sometimes capacitors are used to smooth a current in a circuit. When power is supplied to a circuit that includes a capacitor - the capacitor charges up. When power is turned off the capacitor discharges its electrical charge slowly.A battery will transport charge from one plate to other until the voltage produced by the charge buildup is equal to the battery voltage.



D. *1N4007 DIODE*

The most common function of a diode is to allow an electric current to pass in one direction (called the diode's *forward* direction), while blocking current in the opposite direction (the *reverse* direction). Thus, the diode can be viewed as an electronic version of a *check valve*. This unidirectional behavior is called *rectification*, and is used to convert *alternating current* to *direct current*, including extraction of modulation from radio signals in radio receivers these diodes are forms of rectifiers.

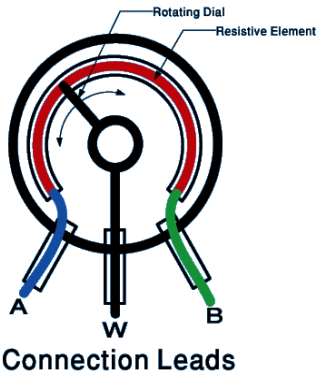
E. *Resistor*

Resistor is a component of an electrical circuit that resists the flow of electrical current. A resistor has two terminals across which electricity must pass, and is designed to drop the voltage of the current. A resistor is primarily used to create and maintain a known safe current within an electrical component. Resistance is measured in ohms , after Ohm 's law. This rule states that electrical resistance is equal to the drop in voltage across the terminals of the resistor divided by the current being applied to the resistor. A high ohm rating indicates a high resistance to current. This rating can be written in a number of different ways depending on the ohm rating. For example- 81R represents 81 ohms, while 81K represents 81,000 ohms.

F. *Potentiometer (POT/variable resister)*

A pot in electronics technology is a component. A three-terminal resistor with a sliding contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a *variable resistor* or *rheostat*. A potentiometer measuring instrument is essentially a voltage divider used for measuring electric potential (voltage); The component is an implementation of the same principle, hence its name.

A *linear taper potentiometer* (*linear* describes the electrical characteristic of the device, not the geometry of the resistive element) has a resistive element of constant cross-section, resulting in a device where the resistance between the contact (wiper) and one end terminal is proportional to the distance between them. Linear taper potentiometers are used when the division ratio of the potentiometer must be proportional to the angle of shaft rotation (or slider position), for example, controls used for adjusting the centering of an analog cathode-ray oscilloscope.



G. *Crystal Oscillator*

A **crystal oscillator** is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for digitalintegrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators, but other piezoelectric materials including polycrystalline ceramics are used in similar circuits. Quartz crystals are manufactured for frequencies from a few tens of kilohertz to tens of megahertz. More than two billion crystals are manufactured annually. Most are used for consumer devices such as wristwatches, clocks, radios, computers, and cellphones. Quartz crystals are also found inside test and measurement equipment, such as counters, signal generators, and oscilloscopes.

H. *Transistor (BC547)*

A **transistor** is a semiconductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

I. *Switch*

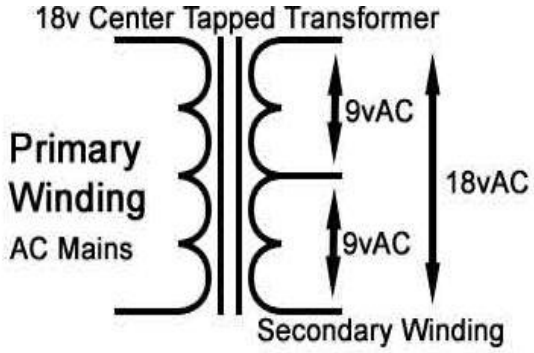
In electrical engineering, a **switch** is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The most familiar form of switch is a manually operated electromechanical device with one or more sets of electrical contacts, which are connected to external circuits. Each set of contacts can be in one of two states: either "closed" meaning the contacts are touching and electricity can flow between them, or "open", meaning the contacts are separated and the switch is nonconducting. The mechanism actuating the transition between these two states (open or closed) can be either a "*toggle*" (flip switch for continuous "on" or "off") or "*momentary*" (push-for "on" or push-for "off") type.

V. TRANSFORMER (STEP DOWN)

In electronics, a **center tap** is a connection made to a point halfway along a winding of a transformer or inductor, or along the element of a resistor or a potentiometer. Taps are sometimes used on inductors for the coupling of signals, and may not necessarily be at the half-way point, but rather, closer to one end. A common application of this is in the Hartley oscillator. Inductors with taps also permit the transformation of the amplitude of alternating current (AC) voltages for the purpose of power conversion, in which case, they are referred to as autotransformers, since there is only one winding. An example of an autotransformer is an automobileignition coil. Potentiometer tapping provides one or more connections along the device's element, along with the usual connections at each of the two ends of the element, and the slider connection. Potentiometer taps allow for circuit functions that would otherwise not be available with the usual construction of just the two end connections and one slider connection.

VI. VCT

Volts center tapped (VCT) describes the voltage output of a center tapped transformer. For example: A 24 VCT transformer will measure 24 VAC across the outer two taps (winding as a whole), and 12 VAC from each outer tap to the center-tap (half winding). These two 12 VAC supplies are 180 degrees out of phase with each other, thus making it easy to derive positive and negative 12 volt DC power supplies from them.



VII. ADVANTAGES OF PROPOSED SYSTEM

- Reduce Operations and Maintenance Costs
- Improve Staff Productivity
- Environmental Sustainability Policy
- Reduced Energy Cost

VIII. CONCLUSION

The project "Car Parking Monitoring Using PLC and SCADA" has the advantages of SCADA & PLC. PLC is used for automation and SCADA for control and monitoring. This project ensures less maintenance and reduces risk factor and also increases the efficiency. Now a day's PLC and SCADA plays an important role in industrial automation . In our project we have utilized the application of PLC and SCADA effectively.

ACKNOWLEDGMENT

We would like to thank our University for providing the infrastructure to carry out the research, Mr. D.B.V. Singh, H.O.D (dept. of electronics and instrumentation engineering),
our guide Mr. N.S. Rana, co-guide Mr. Sandeep Kalundrekar
& friends who helped me throughout the project.

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