INTELLIGENT POWER SAVING SYSTEM
Design Specification Document

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1 Introduction

Intelligent Power Saving System, the aim of the project is to save the energy. In this project we are using various sensors, controlling and display.

However, in this project work the basic signal processing of various parameters which are temperature, LDR, Smoke sensor. For measuring various parameters values, various sensors are used and the output of these sensors are converted to control the parameters. The control circuit is designed using micro-controller. The outputs of all the three parameters are fed to micro-controller. The output of the micro-controller is used to drive the LCD display, so that the value of each parameter can be displayed. In addition to the LCD display micro-controller outputs are also used to driver a relay independently. This relay energizes and de-energizes automatically according to the condition of the parameter.

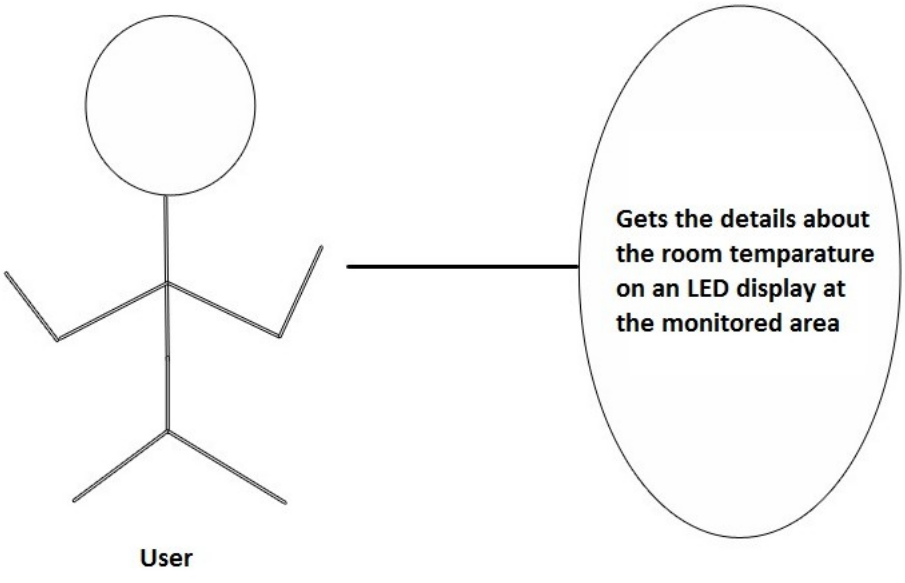
2 System Design

The UML use case diagram is used to represent the user perspective.The system can be divided into three modules.
1.PIR sensor, LDR and Thermostat(Input).
2.The microcontroller and dimmers(processing the input signal and storing the programs for the working of the system).
3.The LCD display, fan and bulb(Output).

The flow of data through different modules of the system are represented by the Data Flow Diagrams(DFD).An integrated DFD is used to represent the overall system.

2.1 User perspective

The user perspective is represented by UML Use Case Diagram.



The functions related to each modules are given below.

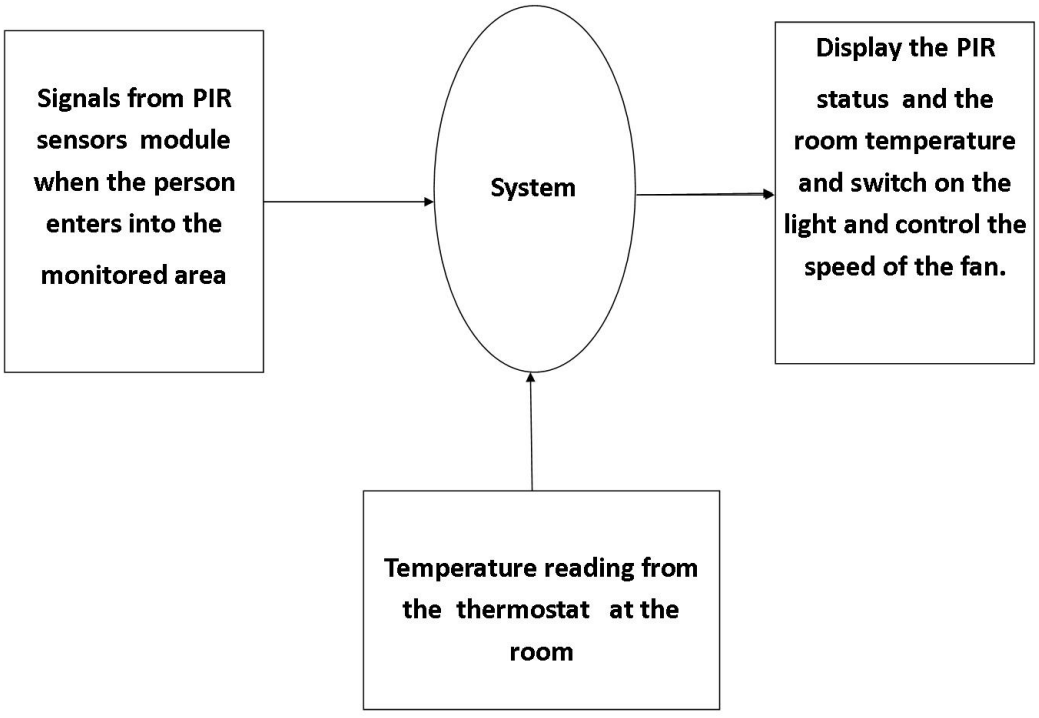
1. Input: When a person enters into the monitered area an interrupt is produced at the PIR sensor module kept at its entrance. At the same time, thermostat an LDR become active. As a result, a difference in the output voltage levels of the sensors is produced, and is given to the input ports of microcontroller.These signals are used by the microcontroller to detect the presence of a person, temperature level and intensity in the room.
2. Signal Processing:The modulated analog signals from the sensors are demodulated and digitized by the microcontroller.
3. Output: The microcontroller outputs signals to the dimmer circuits so that they can control the intensity of bulb and speed of the fan.

3 Data flow through modules - Data Flow Diagram

The data flow through various modules of the system are shown below.

3.1 Level zero Data Flow Diagram

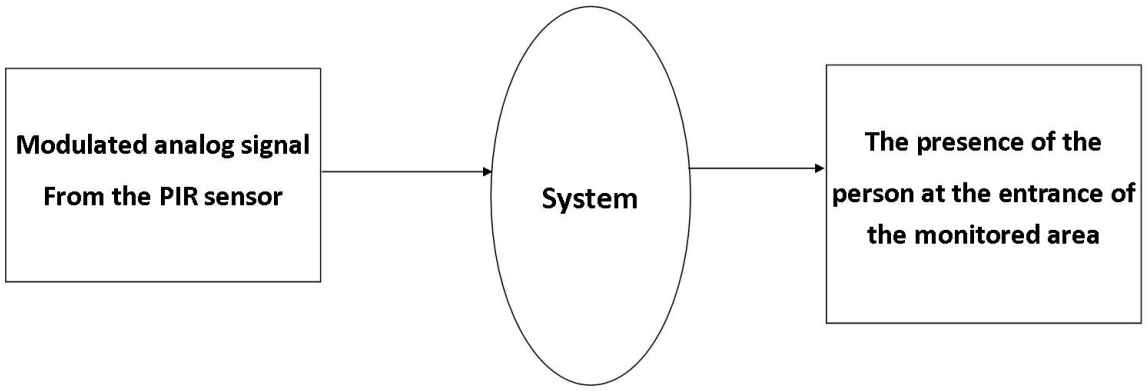
The level zero DFD given below represents the system in the most outer layer.



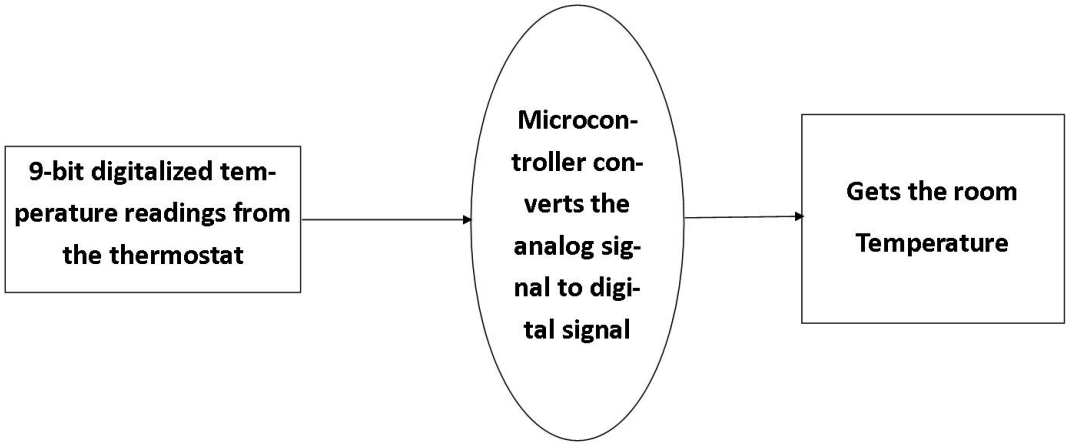
4 Level 1 Data Flow Diagrams

The level-1(High level) Data Flow Diagrams of each modules are given below.

- **Input**



Sensor at the entrance of the monitored area

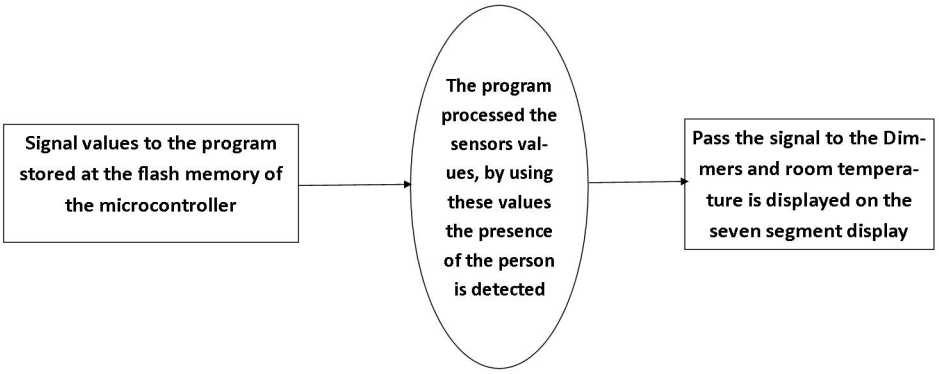


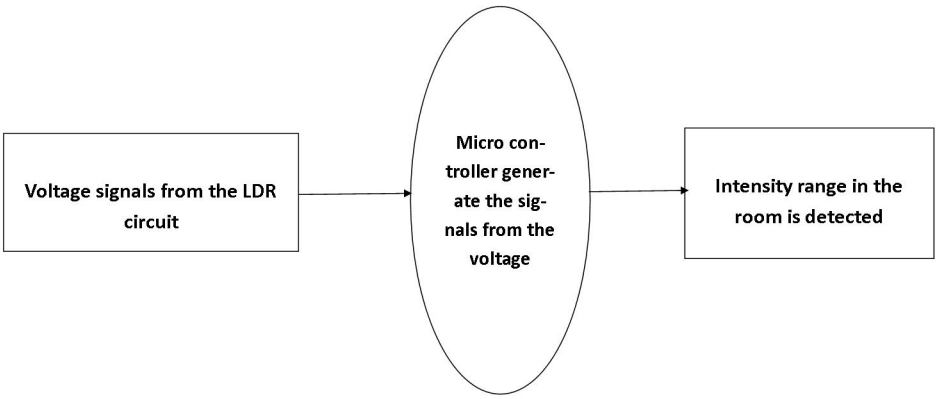
Thermostat at the of the monitored area

Input:When a person enters into the monitered area, PIR sensor detects the presence of the person by interrupting the sensor signals.

When a person is present in the monitered area, the system will be switched ON and thermostat and LDR become active and give inputs to the microcontroller.This inputs are used to control the intensity of bulb and speed of the fan.

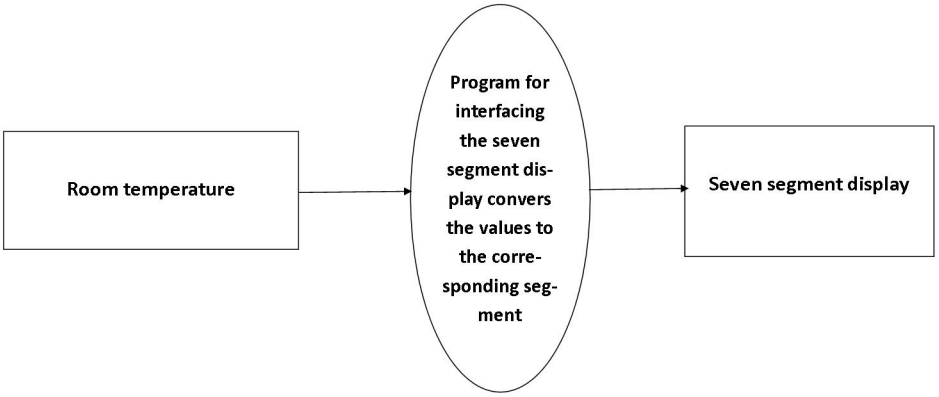
- **Signal Processing**

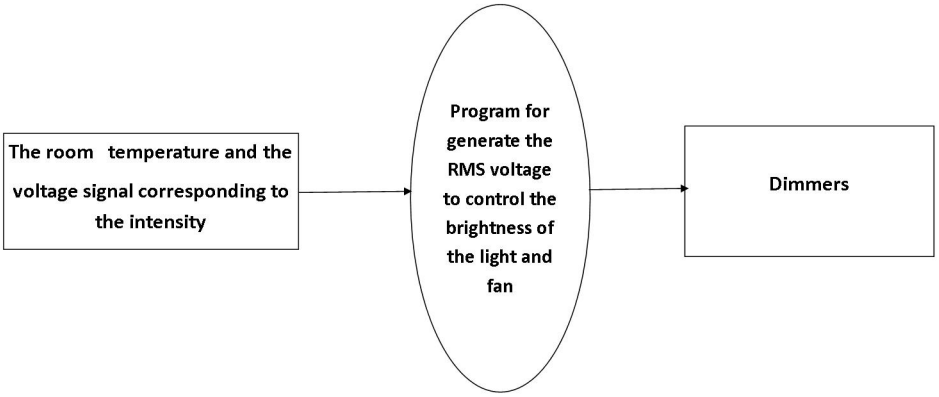




The signals from the sensor modules are processed by the microcontroller module to detect the presence of person as well as to control the intensity of bulb and speed of the fan.

- **Output**

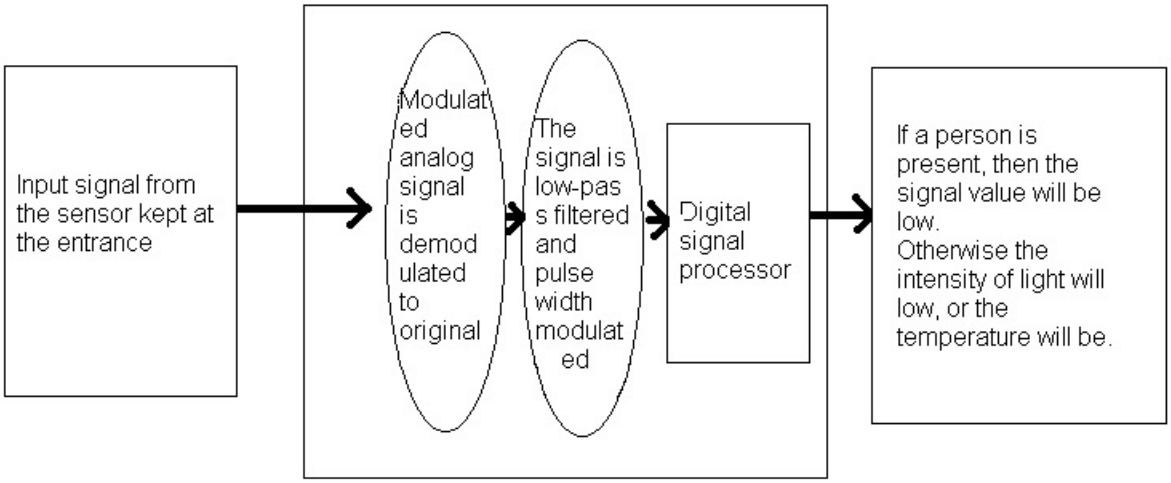


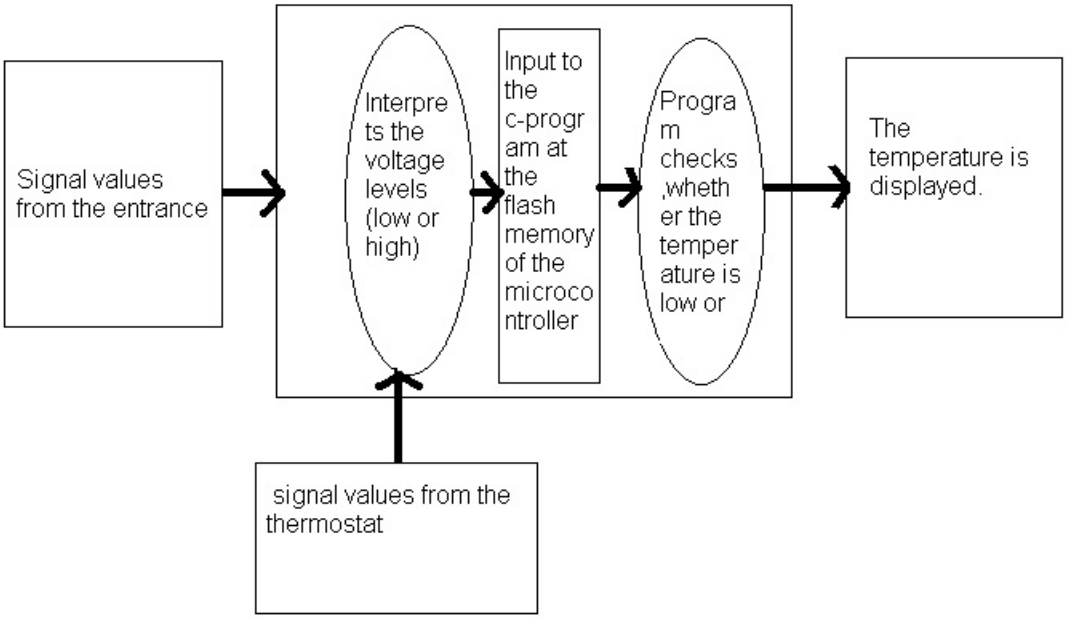


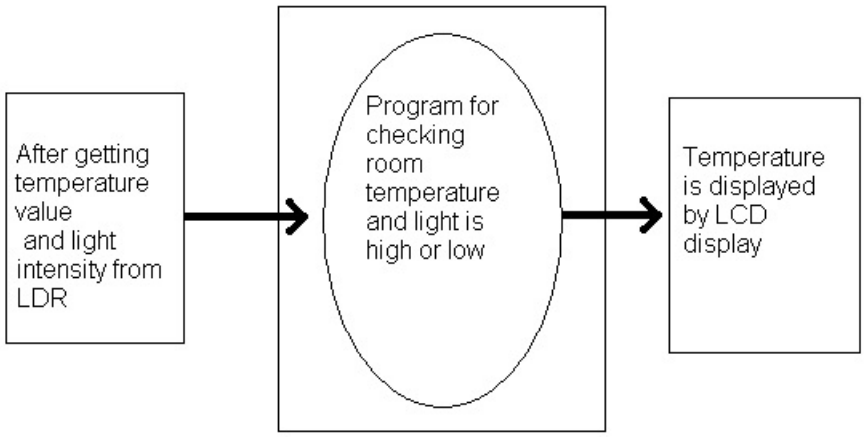
The C program burned into the flash memory of the microcontroller receives the input signals from the sensors and based on this input it find outs the presence of the person, temperature and intensity in the monitered area.The temperature is displayed into a seven segment display system.And the intensity of bulb and speed of the fan will be adjusted.

4.1 Level 2 Data Flow Diagrams

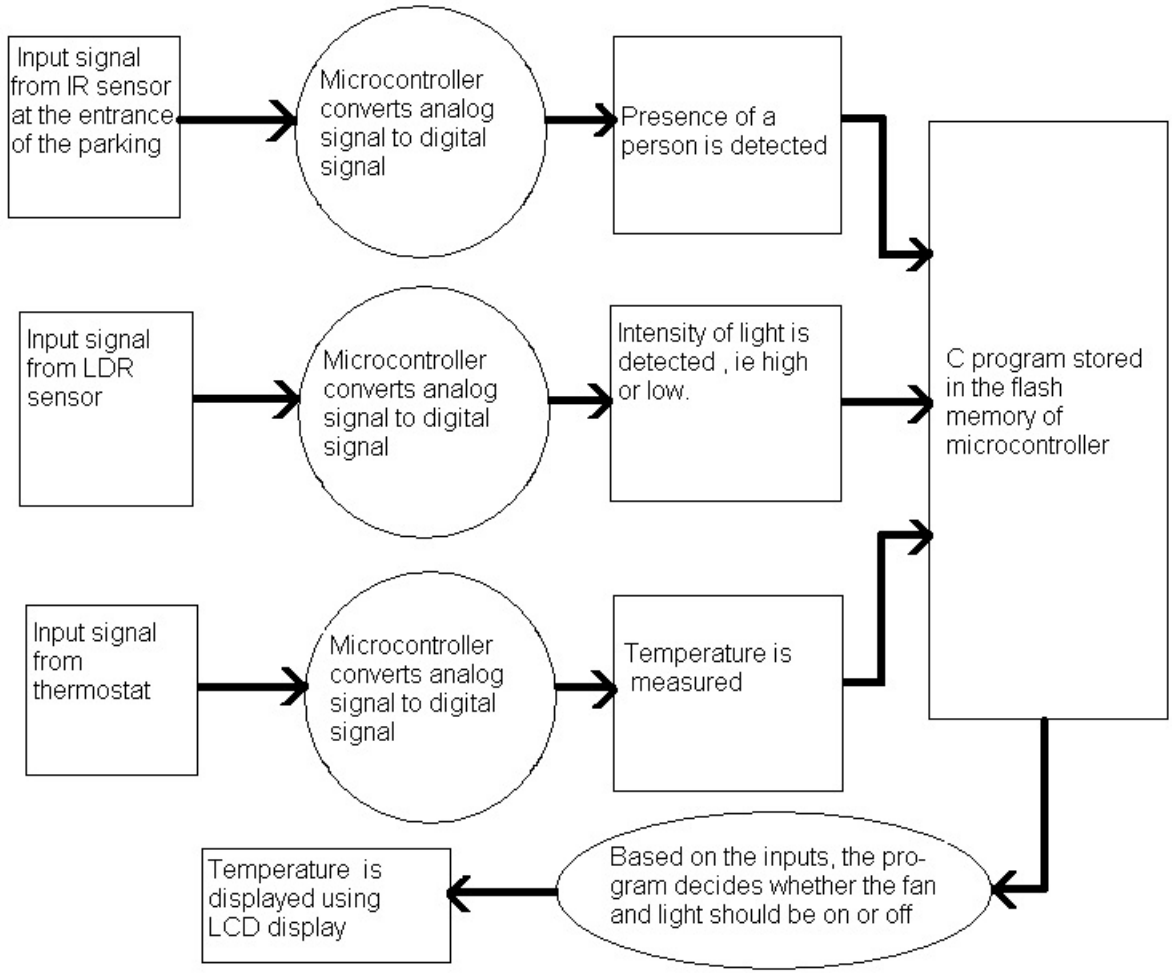
The Level 2 Data Flow Diagrams which describes the internal working of each modules(ie.input section,signal processing section and the output section) are given below.







4.2 Overall System Design - Integrated Data Flow Diagram



The system is divided into three logical modules:-

1. Sensor modules:PIR sensor, thermostat and LDR sensor are used to give inputs to the microcontroller.The sensor modules are kept at the monitered area.The outputs of the sensors are analog

signals.These signals are modulated and given to the microcontroller module.

2. Microcontroller module:- The microcontroller module(PIC 16F72) demodulates,low-pass filters and digitizes the signal.The voltage level difference from sensors help to identify the presence of the person , intensitity level and temperature level in the monitered area.The C program burned to the flash memory of microcontroller controls the intensity of bulb and speed of the fan based on the sensor signals.

3. Output module:-The display section is a seven segment display kept in the monitered area.The microcontroller outputs the temperature of the room the display section.The speed of the fan and intensity of the bulb varies according to the microcontroller output. A C program is burned to the microcontroller for interfacing the output module.

5 References

- **Wikipedia**, *http://www.wikipedia.org/*
- **Software Engineering A Practitioner's Approach 6th edition** *Roger S. Pressman*
- **Fundamentals of Software Engineering, Second Edition** *Carlo Ghezzi, Mehdi,Dino*
- **Software Engineering, Sixth Edition***Ian Sommervile*