**IoT & Automation Lab.**

**Assignment#1**

1. **Prototype? Open-Source and Closed-Source Prototype Platforms:**

A prototype is an early sample, model, or release of a product built to test a concept or process.

* Open-source: Open source is source code that is made freely available for possible modification and redistribution.

E.g. **Arduino, Raspberry Pi.**

* Closed**-source: Closed-source model source code is not released to the public, i.e. it is not available on the public domains.**

E**.g. Google Earth, Skype, WinRAR, Microsoft Windows, Mac OS**

1. **Arduino?**

Arduino is a small popular electronic machine that makes it very easy for people to make electronic things.

It has two parts:

* a Circuit Board
* a program that lets people tell the circuit board what to do.

1. **Arduino Uno R3 Key Specifications:**

* Main Processor
  + ATmega328P, a modified Harvard architecture 8-bit RISC\* processor core. \**Reduced Instruction Set Computer*
* Memory (SRAM, FLASH MEMORY, EEPROM)
  + **SRAM:** Static Random Access Memory a type of RAM which uses a flip-flop to store 1-bit of data.
    - * The system's temporary data or run-time data is stored in the SRAM; with a size of 2KB.
  + **FLASH MEMORY:** In Arduino, the Flash stores the application code to be run.
    - * The Size of Flash Memory is 32KB.
  + **EEPROM:** An Electrically Erasable Programmable Read-Only Memory. It is a form of non-volatile memory that can remember things with the power being turned off, or after resetting the Arduino.
    - * The Size of EEPROM is 1KB.
* I/O Pins
  + **An Arduino has 14 digital input/output pins (of which 6 can be used as PWM\* outputs), 6 analog inputs.**

**Assignment#2**

* **What is an Encoding format? List down encoding formats for various types of data (Text, Number, Photo, Audio, Video).**

**~ Encoding Formats: A Brief Overview ~**

**Encoding format is essentially a standardized method to translate data into a format that computers can understand and process efficiently. It's like converting human language into a language computer can comprehend.**

* **Different Encoding Formats:**
* **Text Encoding**

**Text data is represented by characters, which are assigned specific numerical values. These values are then stored and transmitted in a specific format.**

**- ASCII (American Standard Code for Information Interchange): Represents 128 characters, including uppercase and lowercase letters, numbers, punctuation, and control characters.**

**- Unicode: A more comprehensive character encoding standard, capable of representing text in almost all languages. It includes ASCII as a subset.**

**- UTF-8: A variable-length encoding scheme compatible with ASCII, widely used for web pages and email.**

* **Number Encoding**

**Numbers are represented digitally using different numerical systems.**

**- Binary: Uses only 0s and 1s.**

**- Decimal: The base-10 system we commonly use.**

**- Hexadecimal: Uses 16 digits (0-9, A-F).**

**- Floating-point: Represents real numbers with a decimal point.**

* **Image Encoding**

**Images are represented by pixels, each with color information.**

**- JPEG (Joint Photographic Experts Group): Lossy compression, suitable for photographs.**

**- PNG (Portable Network Graphics): Lossless compression, suitable for images with sharp edges and text.**

**- GIF (Graphics Interchange Format): Supports animation and transparency, often used for simple images and logos.**

**- BMP (Bitmap): Uncompressed format, large file size.**

**- TIFF (Tagged Image File Format): Lossless compression, supports various image depths.**

* **Audio Encoding**

**Audio data is represented by digital samples of sound waves.**

**- MP3: Lossy compression, widely used for music.**

**- AAC (Advanced Audio Coding): Lossy compression, often used in iTunes**

**and digital broadcasting.**

**- WAV (Waveform Audio File): Lossless compression, high-quality audio format.**

**- FLAC (Free Lossless Audio Codec): Lossless compression, maintains audio quality.**

* **Video Encoding**

**Video data combines image and audio data.**

**- MP4 (MPEG-4 Part 14): Commonly used for video storage and distribution.**

**- AVI (Audio Video Interleave): Container format supporting various codecs.**

**- MOV (QuickTime Movie): Apple's video format.**

**- WMV (Windows Media Video): Microsoft's video format.**

**Assignment#3**

* Explain Basic Structure of an Arduino Program.
* There are two required parts or functions that enclose blocks of statements.
* **setup()** is the preparation, **loop()** is the execution.
* Both functions are required for the program to work.

void setup()

{

statements;

}

void loop()

{

statements;

}

* **The setup() function is called once**, when the Arduino board is first turned on or reset. It is used to initialize the board and set up the hardware.

The setup function should follow the declaration of any variables at the very beginning of the program. It is **the first function to run in the program**, is run only once, and is used to set **pinMode** or initialize serial communication.

Setting pinMode: This tells the Arduino **whether a specific pin is going to be used for input** (reading data) or **output** (sending data).

For example, if you have an LED connected to pin 13, you would specify in the setup() function that pin 13 is an output pin.

**Initializing Serial Communication:** This is like **opening a communication channel** between your Arduino and your computer or another device. This is useful for **sending data back and forth**.

* **The loop() function is called repeatedly,** until the Arduino board is turned off or reset. It is where the Arduino program does most of its work.

The loop function follows next and includes the code to be executed continuously – reading inputs, triggering outputs, etc.