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IOT BASED SOLUTION FOR MONOTORING OF POLLUTION THROUGH PESTICIDES IN FRESH FRUITS AND VEGETABLES AVAILBLE IN THE MARKET

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Abstract:

The uses of pesticides, steroids and fertilizers has to be tremendously increasing the negative effects caused to the people in terms of health. Harmful pesticides enter into the human body through fruits and vegetables, so that optimal solution is needed to analyses the pesticides detected in the fruits the common man is consuming. Hardware design and software design are obtaining an accurate and the real time output. In this Project, a solution is developed with the use of three sensors, Arduino and to get the information about the presence of pesticides. The threshold value of pesticide is given and which is healthy to be consumed by animals and humans is given by Embedded C Program. If a fruit is detected to belong in a range above the threshold level, then it is said to contain more pesticides which is un healthy to eat. Through IoT, the pesticide content and the values obtained from each sensor are shown in Thingspeak Server.

Keywords: Arduino, WSN, GSM, gas sensor, LCD.

Introduction:

Pesticides play a major role in the production of fruits and vegetables. Mainly pesticides are used to flourish the growth of fruits, but there is a level of safe consumption of pesticides. There are many methods by which the pesticides could be detected. A hardware and software simulation using IoT and Embedded has been done in this project to improve the efficiency and accuracy. An IoT (Internet of Things) system mainly consists ofsensors/devices that have to be connected to the Cloud with the help of an internet connectivity. Once the data reaches the Cloud, the processing is done and an alert is given to the required person. Monitoring of pesticides in fruit and vegetable

samples has increased in the last years since most countries have established maximum residue level (MRL) for pesticides in food products . With the gradual advance of urbanization construction, the procurements of vegetables and fruits are most in markets and supermarkets. However, these procurement locations almost have no pesticide residues detection devices. Gas chromatography (GC), liquid chromatography (LC) or combinations (GC-MS or LC-MS/MS) are traditional analytical techniques for identification and quantity determination of pesticides residues . Although these methods offer quantitative analysis with sensitivity and selectivity, they are slow, expensive,

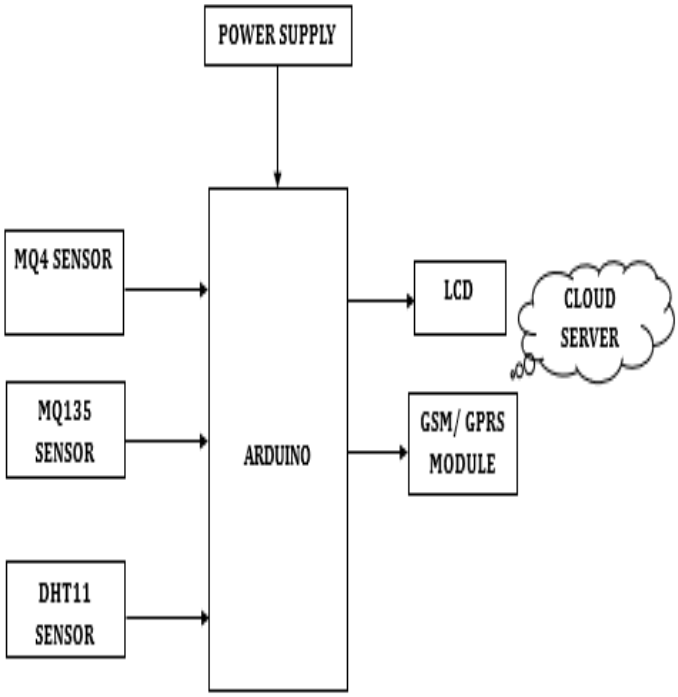
laborious and not convenient to popularize and promote. Moreover, they don’t have the ability of information sharing and remote control.

Proposed System

Here we proposed a new system in simple way to detect pesticides and also find temperature & humidity of fruits and

vegetables. DHT11 sensor and gas sensors are connected to Arduino, when they are detected display that values in LCD

Block Diagram:



Hardware Requirements:

- Aurdino
- DHT 11 Sensor
- MQ4 Sensor
- LCD
- GSM/GPRS Module
- power Supply

Embedded system implementation

Introduction:

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic controlsystems, etc. User interface.

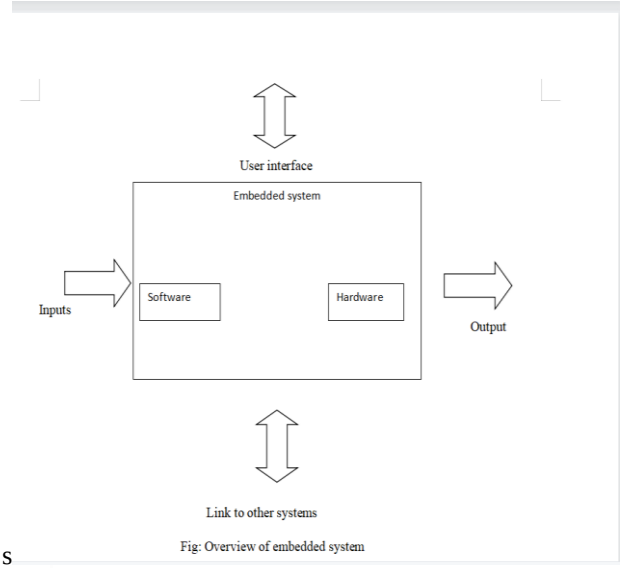


Fig: Overview of embedded system

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Software Requirements:

- Aurdino IDE
- Embedded C
- Fritzing

Arduino IDE:

Arduino IDE where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

Introduction to Arduino IDE:

- Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a

vital role for debugging, editing and compiling the code in the environment.

- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.
- This environment supports both C and C++ languages.

How to install Arduino IDE:

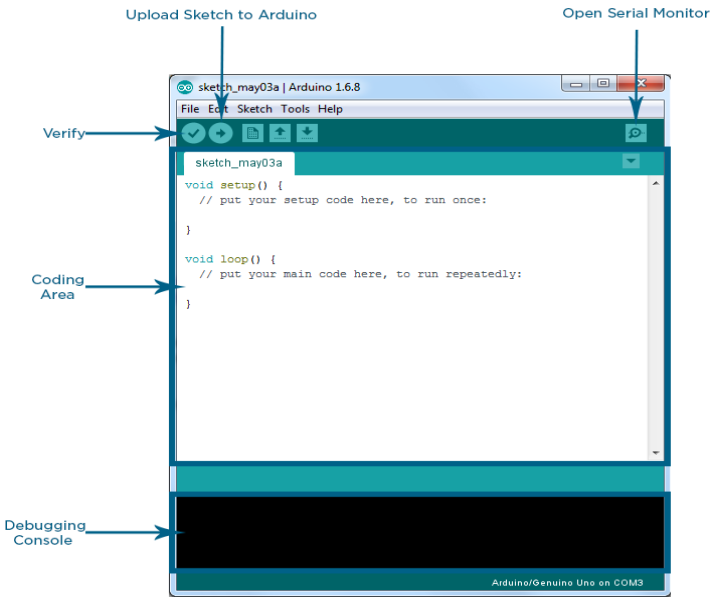
You can download the Software from Arduino main website. As I said earlier, the software is available for common operating systems like Linux, Windows, and MAX, so make sure you are downloading the correct software version that is easily compatible with your operating system.

- If you aim to download Windows app version, make sure you have Windows 8.1 or Windows 10, as app version is not compatible with Windows 7 or older version of this operating system.

The IDE environment is mainly distributed into threesections

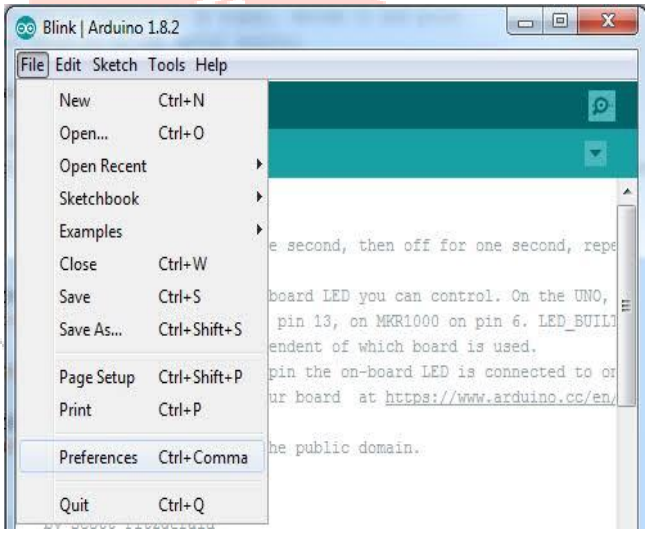
- **1. Menu Bar**
- **2. Text Editor**
- **3. Output Pane**

As you download and open the IDE software, it will appear like an image below.

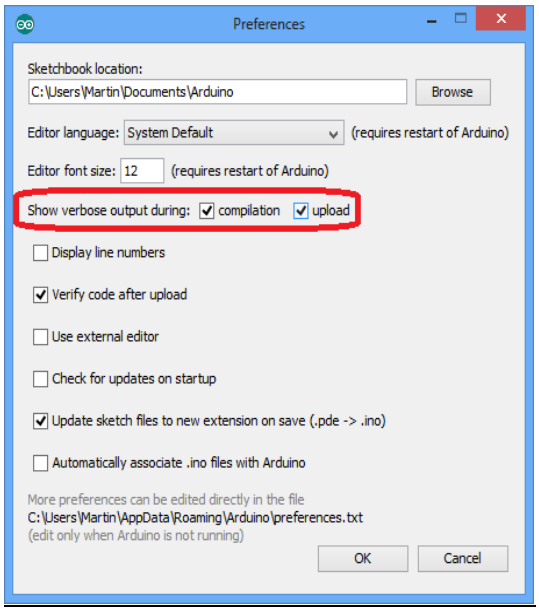


The bar appearing on the top is called **Menu Bar** that comes with five different options as follow

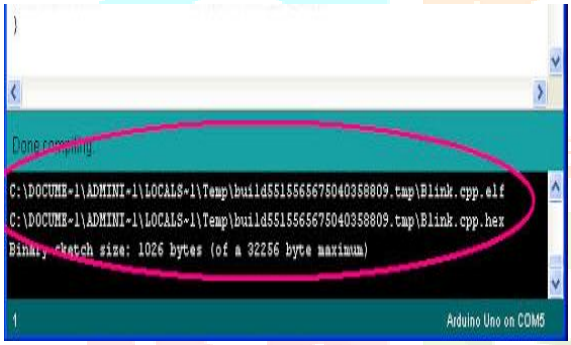
- **File** – You can open a new window for writing the code or open an existing one. Following table shows the number of further subdivisions the file option is categorized into.



As you go to the preference section and check the compilation section, the Output Pane will show the code compilation as you click the upload button.

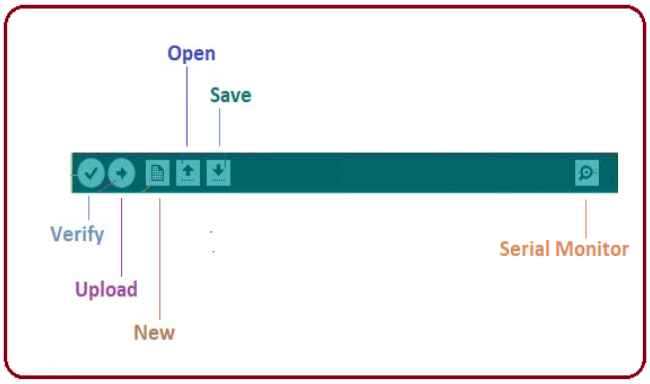


And at the end of compilation, it will show you the hex file it has generated for the recent sketch that will send to the Arduino Board for the specific task you aim to achieve.



- **Edit** – Used for copying and pasting the code with further modification for font
- **Sketch** – For compiling and programming
- **Tools** – Mainly used for testing projects. The Programmer section in this panel is used for burning a bootloader to the new microcontroller.
- **Help** – In case you are feeling skeptical about software, complete help is available from getting started to troubleshooting.

The **Six Buttons** appearing under the Menu tab are connected with the running program as follow.



- The check mark appearing in the circular button is used to verify the code. Click this once you have written your code.
- The arrow key will upload and transfer the required code to the Arduino board.
- The dotted paper is used for creating a new file.
- The upward arrow is reserved for opening an existing Arduino project.
- The downward arrow is used to save the current running code.
- The button appearing on the top right corner is a **Serial Monitor** – A separate pop-up window that acts as an independent terminal and plays a vital role for sending and receiving the Serial Data. You can also go to the Tools panel and select Serial Monitor, or pressing Ctrl+Shift+M all at once will open it instantly. The Serial Monitor will actually help to debug the written Sketches where you can get a hold of how your program is operating. Your Arduino Module should be connected to your computer by USB cable in order to activate the Serial Monitor.
- You need to select the baud rate of the Arduino Board you are using right now. For my Arduino Uno Baud Rate is 9600, as you write the following code and click the Serial Monitor, the output will show as the image below.
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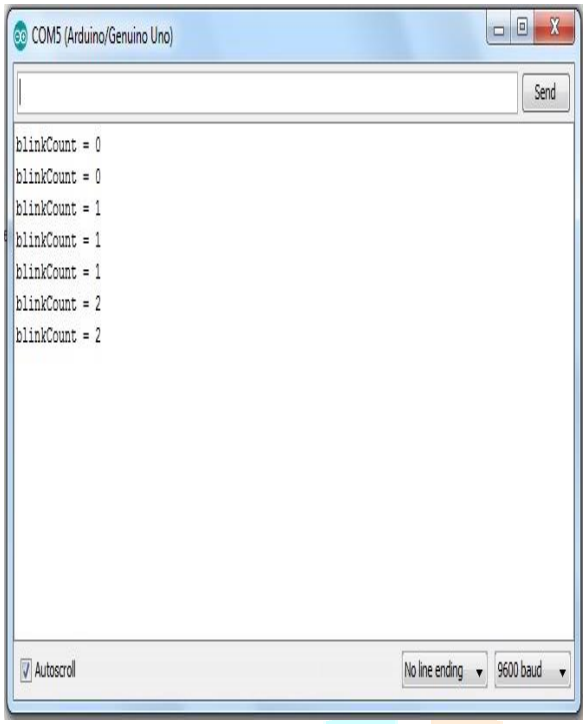
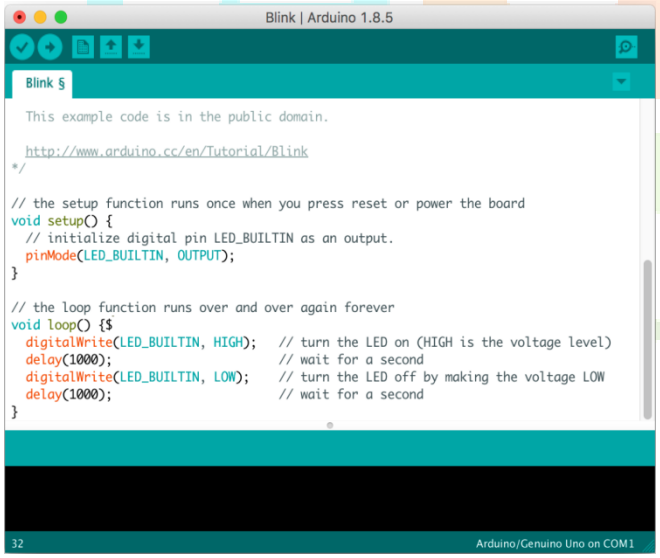


The main screen below the Menu bard is known as a simple text editor used for writing the required code.

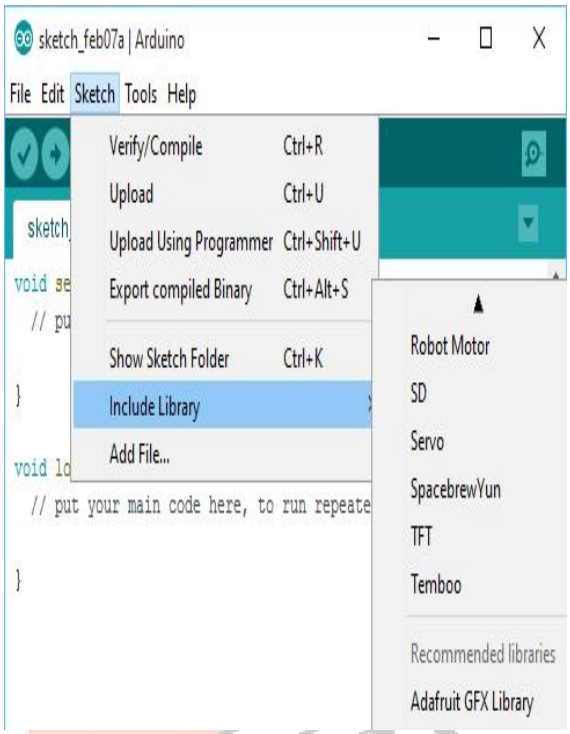


The bottom of the main screen is described as an Output Pane that mainly highlights the compilation status of the running code: the memory used by the code, and errors occurred in the program. You need to fix those errors before you intend to upload the hex file into your Arduino Module.

More or less, Arduino C language works similar to the regular C language used for any embedded system microcontroller, however, there are some dedicated libraries used for calling and executing specific functions on the board.

Libraries:

Libraries are very useful for adding the extra functionality into the Arduino Module. There is a list of libraries you can add by clicking the Sketch button in the menu bar and going to Include Library.



As you click the Include Library and Add the respective library it will on the top of the sketch with a #include sign. Suppose, I Include the EEPROM library, it will appear on the text editor as

#include <EEPROM.h>.

Most of the libraries are preinstalled and come with the Arduino software. However, you can also download them from the external sources.

Making pins Input and output:

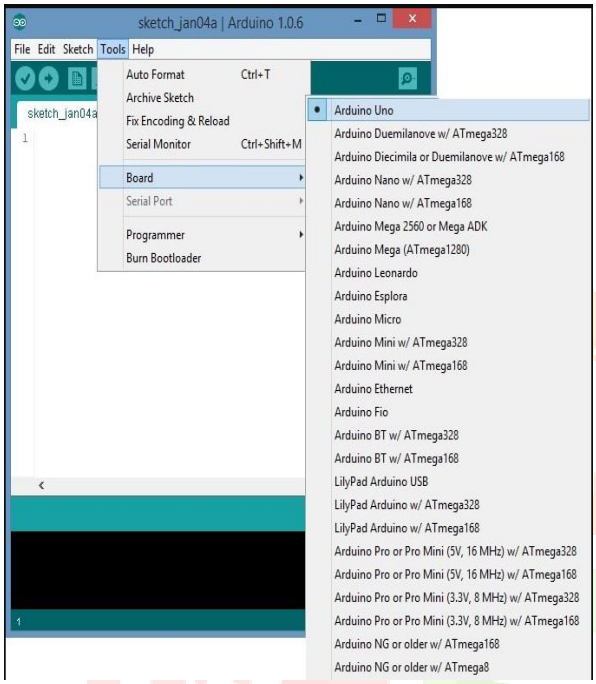
The digitalRead and digitalWrite commands are used for addressing and making the Arduino pins as an input and output respectively.

These commands are text sensitive i.e. you need to write them down the exact way they are given like digitalWrite starting with small “d” and write with capital “W”. Writing

it down with Digitalwrite or digitalwrite won't be calling or addressing any function.

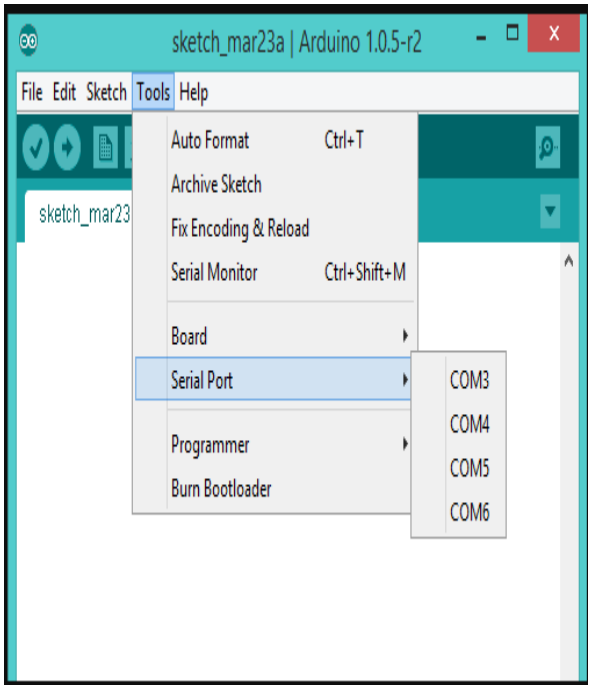
How to select the board:

In order to upload the sketch, you need to select the relevant board you are using and the ports for that operating system. As you click the Tools on the Menu, it will open like the figure below.



- Just go to the "Board" section and select the board you aim to work on. Similarly, COM1, COM2, COM4, COM5, COM7 or higher are reserved for the serial and USB board. You can look for the USB serial device in the ports section of the Windows Device Manager.

Following figure shows the COM4 that I have used for my project, indicating the Arduino Uno with COM4 port at the right bottom corner of the screen.



- After correct selection of both Board and Serial Port, click the verify and then upload button appearing in the upper left corner of the six button section or you can go to the Sketch section and press verify/compile and then upload.
- The sketch is written in the text editor and is then saved with the file extension .ino.

It is important to note that the recent Arduino Modules will reset automatically as you compile and press the upload button the IDE software, however, older version may require the physical reset on the board.

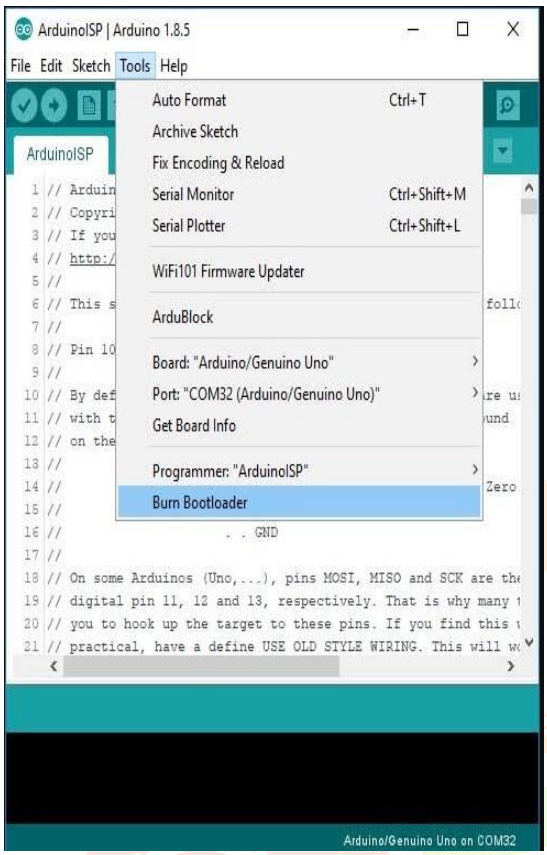
- Once you upload the code, TX and RX LEDs will blink on the board, indicating the desired program is running successfully.

Note: The port selection criteria mentioned above is dedicated for Windows operating system only, you can check this Guide if you are using MAC or Linux.

- The amazing thing about this software is that no prior arrangement or bulk of mess is required to install this software, you will be writing your first program within 2 minutes after the installation of the IDE environment.

BootLoader:

As you go to the Tools section, you will find a bootloader at the end. It is very helpful to burn the code directly into the controller, setting you free from buying the external burner to burn the required code.



When you buy the new Arduino Module, the bootloader is already installed inside the controller. However, if you intend to buy a controller and put in the Arduino module, you need to burn the bootloader again inside the controller by going to the Tools section and selecting the burn bootloader.

Conclusion:

IOT technology can be monitoring the agricultural food products easier, automatic, effective. The establishment and application of agricultural products quality and safety system is based on IOT technology, will provide the whole process of tracking and detecting the food products and meet the public needs of high-quality and safe agricultural products. In recent years, IOT technology has been applied in different areas, but less adoption in monitoring quality and safety of agricultural products.

Advantages:

- Can be used anyone
- Easy to used
- Very effective usage
- Reduction of food usage that cause diseases

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