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**SIT123: Data Capture Technologies**

# Lab Report Week 1: Arduino Blink

Welcome to Arduino!

Arduino is an electronic prototyping platform. Different types of sensors & actuators can be attached to Arduino boards to create our own sensing-thinking-acting systems.

Throughout this unit, we will use Arduino to create different sensing devices, and to retrieve the collected sensor data.

In Week 1, we will try out an introductory exercise, to learn the basic concepts of Arduino.

## Hardware Required

* Arduino Board with in-built LED
* USB cable

## Software Required

Arduino programming environment

## Pre-requisites: You must do the following before this task

**Class (Lecture)**

The labs are built on concepts we discuss in class (lecture). To be able to carry out the lab tasks, you need to know the ideas introduced in the lecture. In addition, the lab tasks are also explained in the lecture. The Lectures are available as PDF and video files on unit website. If you come to the lab without watching that week’s lecture, you will be in a difficult situation. You must watch that week’s lecture before coming to the studio.

**Reading/Videos**

Some labs will have required reading material and/or videos, which you must read/view **BEFORE** you start the lab.

#### Why should you read/watch pre-lab materials?

These materials will help you understand the background which the lab tasks require. Students come to university from diverse backgrounds. Some of you may be familiar with the background information, some of you may not. When you come to the lab prepared, you’re already equipped with confidence and will be able to participate in activities better. Ultimately, class time will be much more productive, dynamic, and fun for everyone.

Here are the pre-lab materials for our first task:

1. Watch TED Talk: <https://www.ted.com/talks/massimo_banzi_how_arduino_is_open_sourcing_imagination#t-1114> (~15 minutes)
2. Watch <https://www.lynda.com/Arduino-tutorials/Creating-your-first-sketch/783858/5015739-4.html> (~3 minutes)
3. Read this task sheet from beginning to end.

## Task Objective

* “We have an Arduino board with an in-built LED light. We need the LED light to be turned on and off continuously, every one second.”

## Task Submission Details

There are six questions in this task. Answer all of them in this word document itself and submit to unit site as part of **Lab Report 1** in Week 3.

### **Q1: The TED talk given under the Pre-Lab materials, shows how Arduino is being used for interesting projects to capture data from the environment, process it, and use it carry out useful actions.**

Fill the given table below to answer the following:

What are three projects that use captured data as given in the TED talk? What data do they capture? What sensors do you think they could use to capture this data?

|  |  |  |
| --- | --- | --- |
| Project name | Data captured | Sensors to capture the data |
| txtBomber | * Type of wall surface * Speed/direction of movement | * Motion sensor |
| PS3 Controller | * Movement coming from a person’s limbs | * Motion sensor |
| Botanicalls | * The moistness of the soil | * Soil moisture sensor |

### **Q2: Consider the given Task Objective. Think about how this simple system can be decomposed to ‘Sense-Think-Act’ as discussed in class (lecture).**

* 1. What is the ‘sensing’ requirement in this system, if any?
     1. Counting the number of milliseconds passed between each blink
  2. What is the ‘thinking’ requirement in this system, if any?
     1. Wait until a second has passed
  3. What is the ‘acting’ requirement in this system, if any?
     1. Turn the LED on or off

### **Q3: Please refer to the provided ‘Arduino Blink Activity Sheet’ and follow the steps.**

1. In Arduino-speak, what is a “sketch”?
   1. A sketch a document that contains all the code for the program to executed on the Arduino
2. setup() and loop() are key Arduino constructs. These are required in every Arduino sketch.
   1. Which of the above two, runs once at the very beginning of your program and never again (unless you reset or upload new code)?
      1. Setup()
   2. Which of the above two, is used to continuously run code over and over again?
      1. Loop()
3. What does **pinMode()** do?
   1. You can set a pin to either input or output signals with this function

Hint: <http://arduino.cc/en/Reference/HomePage>

1. What is a comment?
   1. A comment is a line that is not meant to be read by the compiler but only by programmers. It is intended to be used as a means of internal documentation of the code
2. What does the following line of code do:

delay(x);

* + 1. This function will make the Arduino wait an ‘x’ number of milliseconds before executing the next instruction

Hint: <http://arduino.cc/en/Reference/HomePage>

1. There is something you need to check before uploading your sketch. What is this?
   1. You need to make sure your code does not have any errors which can be done by hitting the verify button. Also make sure the Arduino IDE is pointed to the correct COM port that the board is connected to

### **Q4: How can you test the Blink program to make sure it is working as given in the Task Objective?**

Check to see that the LED located at pin 13 is blinking on and off every one second.

### **Q5: Now that you have built and tested your Blink program, it is time to deliver it (hand it over). Take a five second video of your Arduino board with the LED blinking (use your phone to record) and upload it to youtube. Include the link here. Alternatively, if you are on campus, show your working project to your tutor in the lab and get it marked.**

<https://youtu.be/7dk-d4Tm6ww>

### **Q6: The Morse code is a method of transmitting text information as a series of on-off lights, or clicks.**

1. Create a new Arduino project named ‘BlinkSOS’. Copy and paste your code from the Blink example to the newly created project. Modify the code in the new project, to send an SOS signal in Morse Code via turning the LED on and off.

Upload the ‘BlinkSOS.ino’ file with this document to cloud Deakin.

**[Some helpful hints have been provided for you at the end of this document]**

1. How did you test your code to make sure it is working correctly?
   1. If the LED blinks the same sequence as the SOS morse code indicates, then it is working correctly
2. Take a video of your Arduino board running ‘BlinkSOS’ program and upload it to youtube. Include the link here. Alternatively, if you are on campus, show your working project to your lecturer/tutor in the lab and get it marked.
   1. <https://youtu.be/4tcXm_K1FSI>

***Remember to submit this to cloud Deakin under the correct Assignment folder.***

**Hints for Q6:**

SOS signal in Morse Code: <https://www.youtube.com/watch?v=GnHv7h_5P9M>

Use the International Morse code given here: <https://en.wikipedia.org/wiki/Morse_code#/media/File:International_Morse_Code.svg>

More information about Morse Code: <https://en.wikipedia.org/wiki/Morse_code>

Here is a sample code snippet signalling the letter ‘S’ below:

|  |
| --- |
| /\*\*  \* First signal 'S'  \* Morse code for S is - - -  \* that is, three short blinks.  \*/  digitalWrite(LED\_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)  delay(500); // wait for half a second  digitalWrite(LED\_BUILTIN, LOW); // turn the LED off by making the voltage LOW  delay(1000); // wait for a second  digitalWrite(LED\_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)  delay(500); // wait for half a second  digitalWrite(LED\_BUILTIN, LOW); // turn the LED off by making the voltage LOW  delay(1000); // wait for a second  digitalWrite(LED\_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)  delay(500); // wait for half a second  digitalWrite(LED\_BUILTIN, LOW); // turn the LED off by making the voltage LOW  delay(1000); // wait for a second |

Use your knowledge from the first task, and lecture to decide where the above should go in your code. You now have ‘S’. Next you must write for letters ‘O’ and again ‘S’.

