Software Training Package 1 of 2

Start Date: Monday, September 27, 2021
Due Date: Wednesday, October 6, 2021

Introduction

A new project has started at R3. The team needs to display output on seven segment displays. You are tasked with wiring 2, 7-segment displays to an Arduino using 2 BCD to 7-segment decoders along with a potentiometer. You will then program the 2 7-segment displays to display a number between 0 and 99 based on the potentiometers output/position (Hint: you will need to map the potentiometer output to the expected range). This task will be completed online and simulated through TinkerCAD.

Parts list

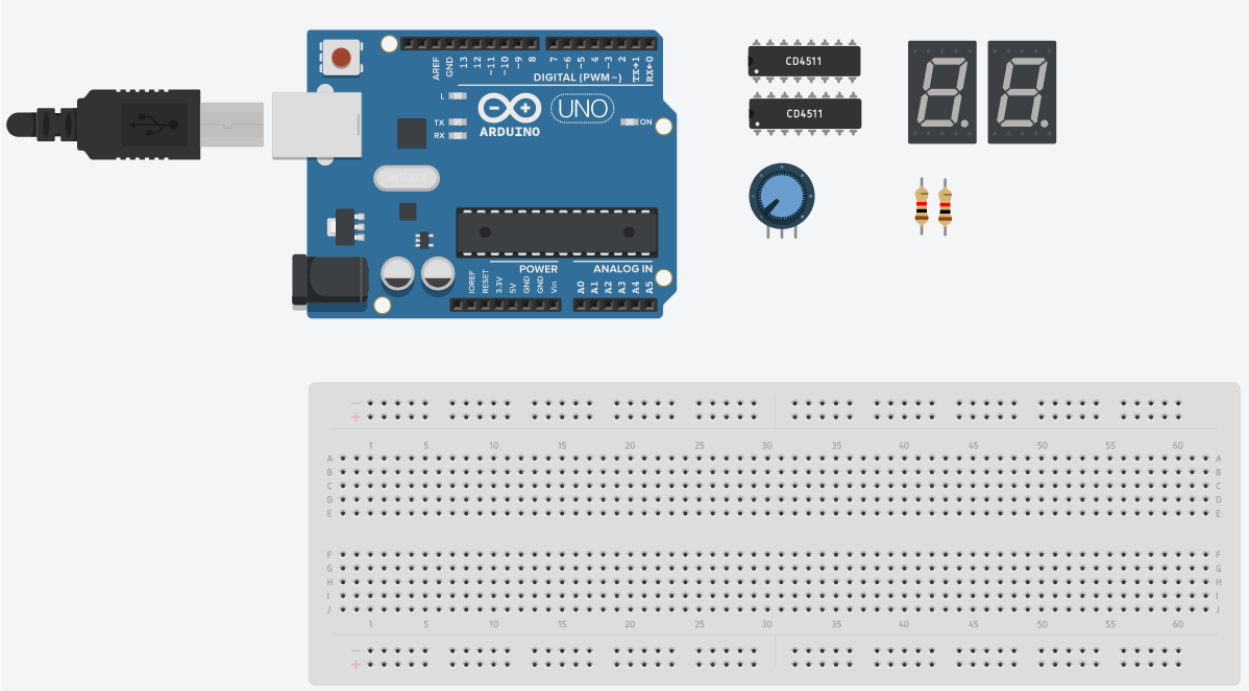


Figure 1: Parts in TinkerCAD

- 2x 7-Segment decoder (CD4511)
- 2x 7-Segment display
- 1x Arduino UNO
- 1x Potentiometer
- Resistors (200Ω to 1kΩ recommended)

Pinouts for the CD4511 and 7-Segment display

More details can be found in the links under the resources section below.

Pin Overview

Pin Name	Pin #	Type	Description
VDD	16	Power	Supply Voltage (+3 to +15V)
GND	8	Power	Ground (0V)
a-f	9-15	Output	Outputs for the 7-segment display
D0-D3	7, 1, 2, 6	Input	4-bit data input
$\overline{LT}$	3	Input	Lamp Test. Turns on all segments when LOW.
$\overline{BL}$	4	Input	Blanking Test. Turns off all segments when LOW.
LE	5	Input	Latch Enable. Stores the current state when HIGH.

Figure 2: CD4511 Pin Overview

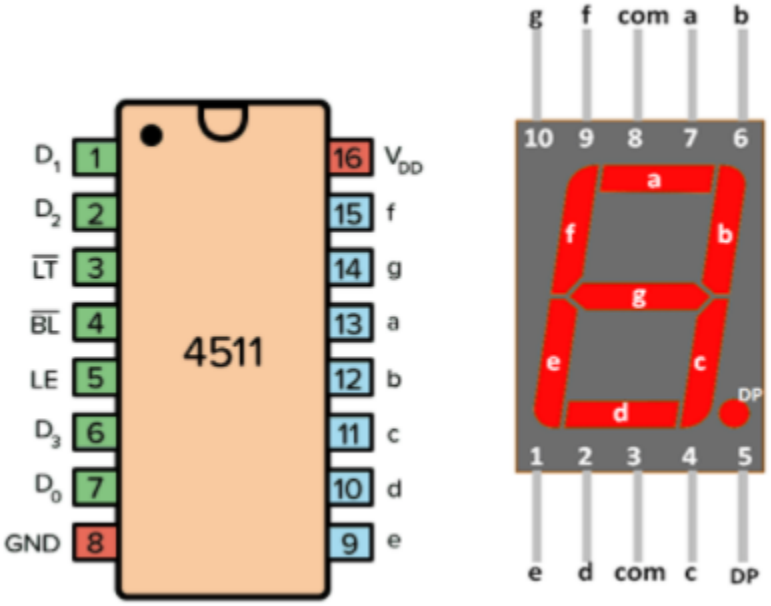


Figure 3: Pinouts for CD4511 and 7-Seg display

Resources:

Git:

- Download - https://git-scm.com/downloads
- Git basics - Learn Git In 15 Minutes
- GitHub desktop - GitHub Desktop
  (For those unfamiliar with using terminal, though I highly recommend getting used to using a terminal)

Arduino:

- Installation - Arduino for Windows
  (Not required, but the tinkercad editor isn't very good)
- Arduino syntax - Arduino Reference
- Arduino basics - You can learn Arduino in 15 minutes.
- Arduino IO - How To Use Arduino's Analog and Digital Input/Output (I/O)

TinkerCAD:

- Create an Account - Join TinkerCAD
- Intro to TinkerCAD - LEDs & Breadboards With Arduino in Tinkercad
- Circuits in TC - Introduction to Tinkercad Circuits & Breadboarding - Part 1

Parts:

- What is a potentiometer - Electronics Basics - How a Potentiometer Works
- CD4511(Decoder) - CD4511 - A BCD to 7-Segment Display Driver Chip
- 7-Segment - 7 Segment Display Pinout, Working, Examples
- Decoder to 7-Segment - Display Decoder - BCD to 7 Segment Display Decoder

Where to start / Notes:

- A great place to begin is to try to understand how all of the parts you are to use function, and how they are wired together. You should also familiarize yourself with the Arduino UNO and its pinout. You can either use the resources provided or find your own.
- You can then familiarize yourself with the TinkerCAD environment which you will use to build and simulate your circuit.
- I recommend first reading the output of the potentiometer. Once that works, get one of the 7-segment displays to work and once you have completed that, expand it to another display.
- Ensure that your code is **clean** and **commented**. Utilize functions and use readable variable / function names, such as for example decoder_pins instead of single character names x, y, etc. (unless it is appropriate).
- Please ensure that your TinkerCAD is wired cleanly, and utilizes colored coded wires for clarity. An example of clean and colored wiring:

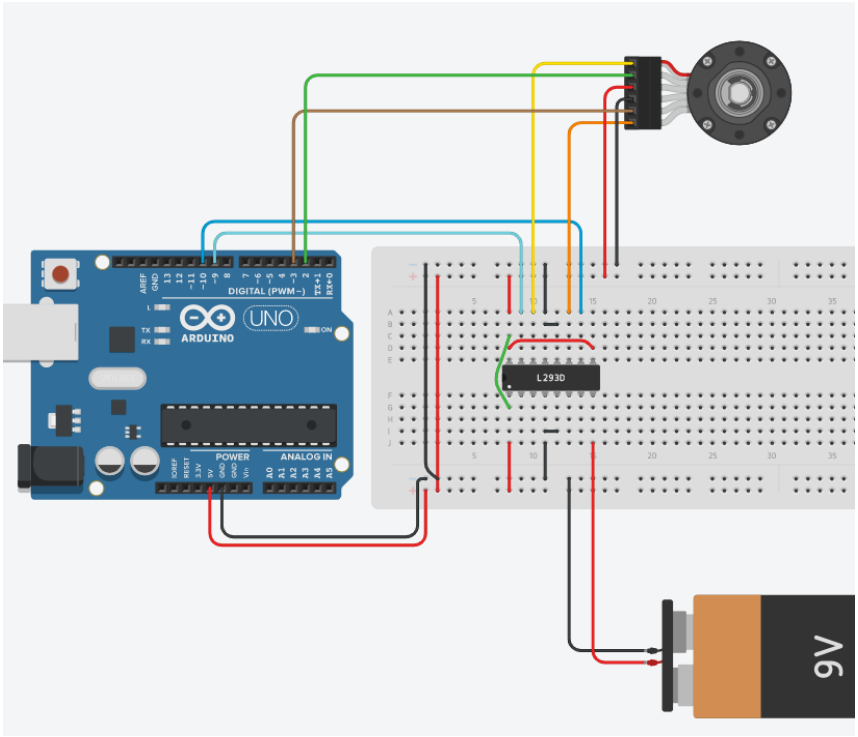


Figure 4: Clean and colored wiring example

Questions and Concerns:

For any questions regarding the task, try to find a solution yourself first. If you still have questions come to the office hours session (TBD). **Do not** email us with questions regarding how to do “x or y” as these emails will be ignored. However, if you have anything that needs clarification, we will be happy to help.

Furthermore, you are to complete this task **solo**, but are free to help each other. **ANY** plagiarism will result in rejection, so please do not copy and paste anything.

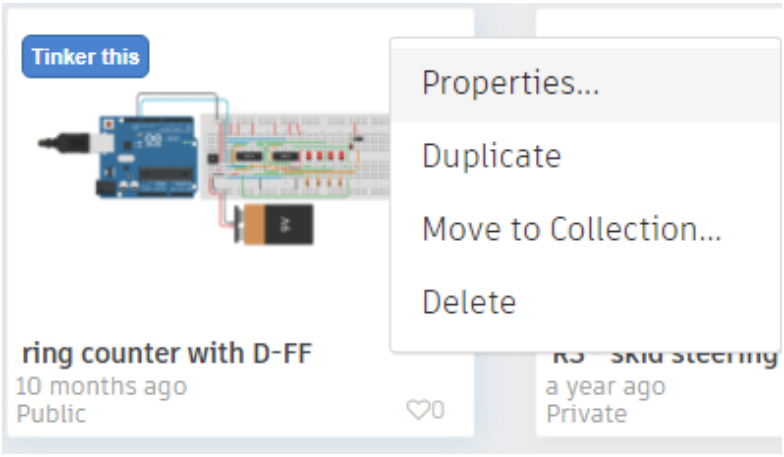
Submission:

In order to submit the task, follow these steps:

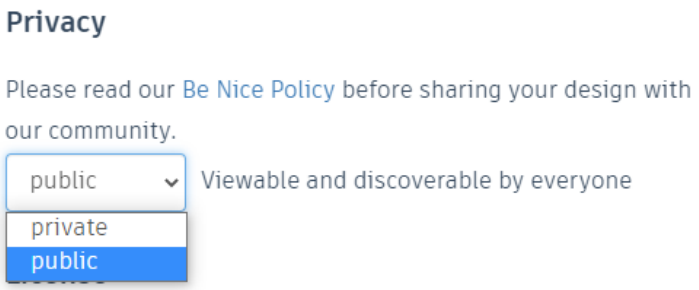
1. Create a public git repository with the name “R3-SoftwareTask1-FirstLast”.
2. Download the Arduino code from the TinkerCad and push it to the repo.
3. Write a detailed readme file detailing how your project works, along with tinkercad diagrams.
    a. If you are unable to complete the project, just explain the parts you have completed and discuss where you were stuck/why you were unable to finish.
4. In your README, add a link to your TinkerCAD project and ensure it is made public.

5. Lastly, copy the links to the GitHub repo and TinkerCAD project and add them to the google form you are to fill out below.

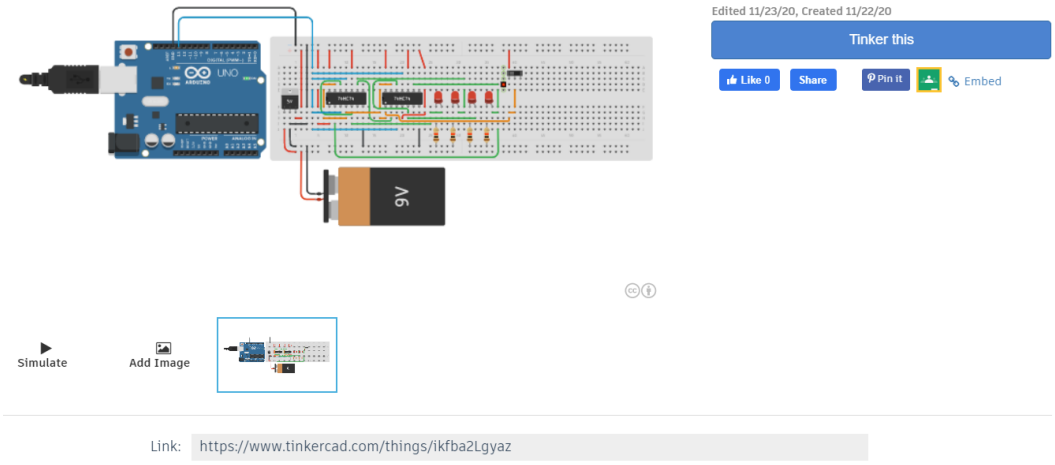
Google form: https://forms.gle/LBMiS1zWQgrCPY8j7
To make your TinkerCAD project public: https://www.youtube.com/watch?v=RLPs1PCvhck
Alternatively you can follow this
How to share TinkerCAD Link:



Click on Settings in the top right corner of a project, and go to properties. Then select public under privacy



Click on the project and copy the link from the bottom



Due Date:

You will have 1.5 weeks to complete this package, so it is due by Wednesday October 6, 2021 at 11:59 PM. Late submissions will not be evaluated, so **submit whatever you have accomplished** by the deadline.