Deliverable G

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GNG 2101

Presented to:
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By:
Group Z11

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Introduction:

This deliverable focuses on the following: the feedback given to our prototypes, the documentation of prototype 2, the performance of the prototype with respect to the target specifications, and our intentions for design day. Following the feedback received for the prototypes, we've implemented most comments and used them to better improve the latest prototype. Our target specifications were not geared towards focused prototype thus obtaining actual results was impossible and experimental results were used.

Client meet 3 feedback

Some of the client feedback received includes:

- On the soldering website, change the header "Lab" to "Activities".
- Link the activities from the corresponding video in the Tutorial section of the website so the students have a better memorization of the activities.
- The soldering test is on the maker repo, so a test on our website is not necessary, however it can be used as a practice test for students.
- Add a maintenance section of the solder station .
- Make sure to increase the difficulty of the examples as the course progress.
- Keep on further developing the prototype.

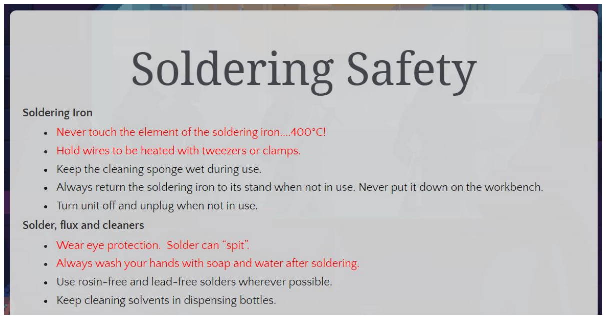
Prototype changes

Prototype: https://solderingcourse.weebly.com/activity.html
Log of changes:

- Changed "Labs" header to "Activities"
- Made the test optional (Practice test)
- Linked corresponding activities to the videos in the "Tutorial" section
- Further developed the activities section
- Prototype of the activities is in progress.

Prototype documentation

Prototype 2 Introduction:



Soldering Safety

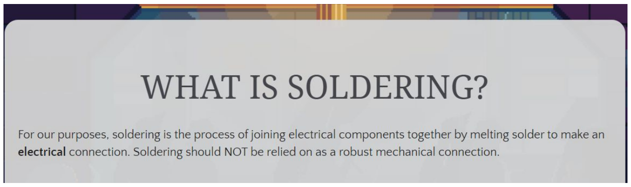
Soldering Iron

- Never touch the element of the soldering iron....400°C!
- Hold wires to be heated with tweezers or clamps.
- Keep the cleaning sponge wet during use.
- Always return the soldering iron to its stand when not in use. Never put it down on the workbench.
- Turn unit off and unplug when not in use.

Solder, flux and cleaners

- Wear eye protection. Solder can "spit".
- Always wash your hands with soap and water after soldering.
- Use rosin-free and lead-free solders wherever possible.
- Keep cleaning solvents in dispensing bottles.

Figure 1: Soldering Safety screenshot



WHAT IS SOLDERING?

For our purposes, soldering is the process of joining electrical components together by melting solder to make an **electrical** connection. Soldering should NOT be relied on as a robust mechanical connection.

Figure 2: What is Soldering? screenshot

The introduction to the course includes a brief description to soldering and a detailed instruction to the safety aspect of the soldering course. It also includes a video and a FAQ section.

Future:

Planning on expanding the introduction part of the soldering to add more useful tips and more explanatory descriptions.

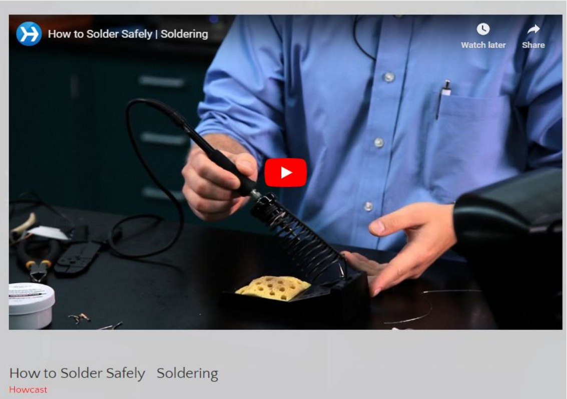
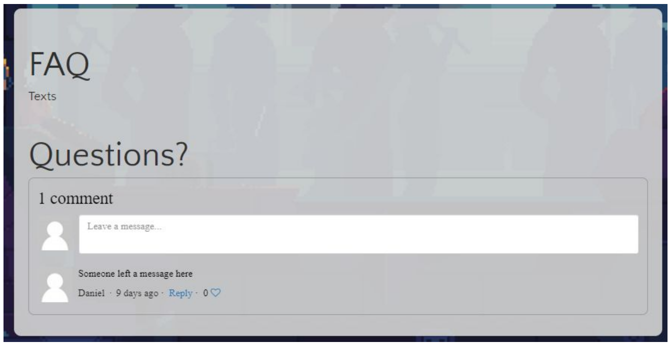

How to Solder Safely | Soldering
Watch later
Share
How to Solder Safely   Soldering
Howcast

Figure 3: How to Solder Safely screenshot



FAQ

Texts

Questions?

1 comment

Leave a message...

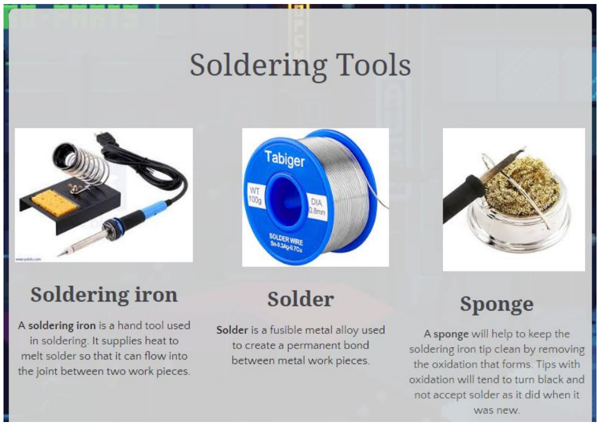
Someone left a message here

Daniel · 9 days ago · Reply · 0 ♡

Figure 4: FAQ screenshot

Prototype 2: Tutorial :

The tutorial part of the course consists of 3 parts: introduction to the soldering tools, how to prepare for soldering, and how to maintain the tools after soldering.



Soldering Tools

Soldering iron

A **soldering iron** is a hand tool used in soldering. It supplies heat to melt solder so that it can flow into the joint between two work pieces.

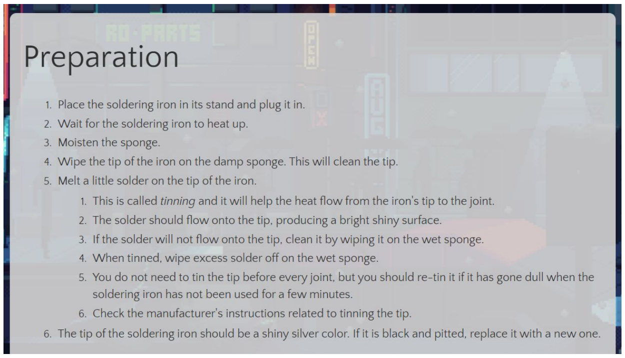
Solder

Solder is a fusible metal alloy used to create a permanent bond between metal work pieces.

Sponge

A **sponge** will help to keep the soldering iron tip clean by removing the oxidation that forms. Tips with oxidation will tend to turn black and not accept solder as it did when it was new.

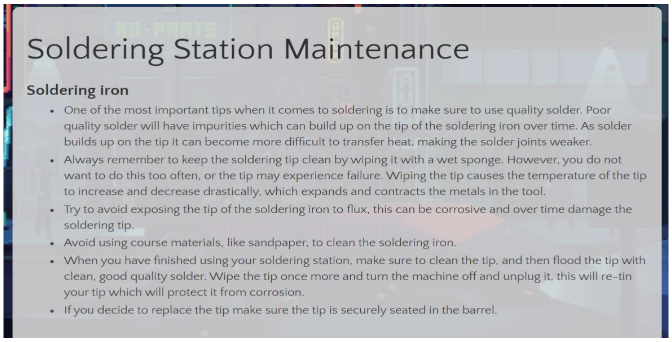
Figure 5: Soldering Tools screenshot



Preparation

1. Place the soldering iron in its stand and plug it in.
2. Wait for the soldering iron to heat up.
3. Moisten the sponge.
4. Wipe the tip of the iron on the damp sponge. This will clean the tip.
5. Melt a little solder on the tip of the iron.
    1. This is called *tinning* and it will help the heat flow from the iron's tip to the joint.
    2. The solder should flow onto the tip, producing a bright shiny surface.
    3. If the solder will not flow onto the tip, clean it by wiping it on the wet sponge.
    4. When tinned, wipe excess solder off on the wet sponge.
    5. You do not need to tin the tip before every joint, but you should re-tin it if it has gone dull when the soldering iron has not been used for a few minutes.
    6. Check the manufacturer's instructions related to tinning the tip.
6. The tip of the soldering iron should be a shiny silver color. If it is black and pitted, replace it with a new one.

Figure 6: Soldering Preparation screenshot



Soldering Station Maintenance

Soldering iron

- One of the most important tips when it comes to soldering is to make sure to use quality solder. Poor quality solder will have impurities which can build up on the tip of the soldering iron over time. As solder builds up on the tip it can become more difficult to transfer heat, making the solder joints weaker.
- Always remember to keep the soldering tip clean by wiping it with a wet sponge. However, you do not want to do this too often, or the tip may experience failure. Wiping the tip causes the temperature of the tip to increase and decrease drastically, which expands and contracts the metals in the tool.
- Try to avoid exposing the tip of the soldering iron to flux, this can be corrosive and over time damage the soldering tip.
- Avoid using course materials, like sandpaper, to clean the soldering iron.
- When you have finished using your soldering station, make sure to clean the tip, and then flood the tip with clean, good quality solder. Wipe the tip once more and turn the machine off and unplug it, this will re-tin your tip which will protect it from corrosion.
- If you decide to replace the tip make sure the tip is securely seated in the barrel.

Figure 7: Soldering Station Maintenance screenshot

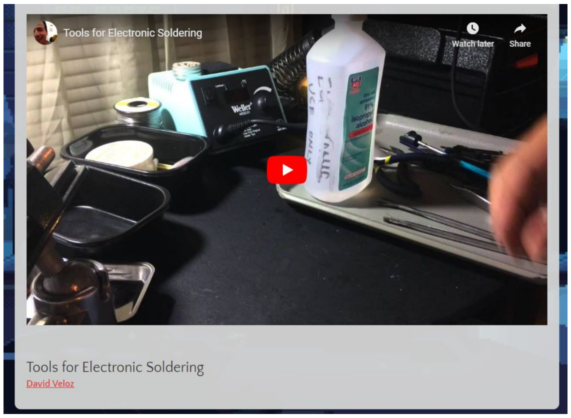

Tools for Electronic Soldering
Watch later
Share
Weller
Tools for Electronic Soldering
David Veloz

Figure 8: Tools for Electronic Soldering screenshot

They all include a video to demonstrate each aspect of the soldering process. The video will be recorded by maker space

Future:

Planning on adding audio on the pictures of the tools to better explain the usage of certain tools, maybe even short animated films.

Prototype 2: Examples:

Right after the introduction to the soldering is finished, there will be an example section to show steps students should take for different scenarios. Currently we plotted out spots for 6 examples which includes the soldering of wires, THT boards, SMD boards, and the removing of the soldiers from those 3 scenarios.

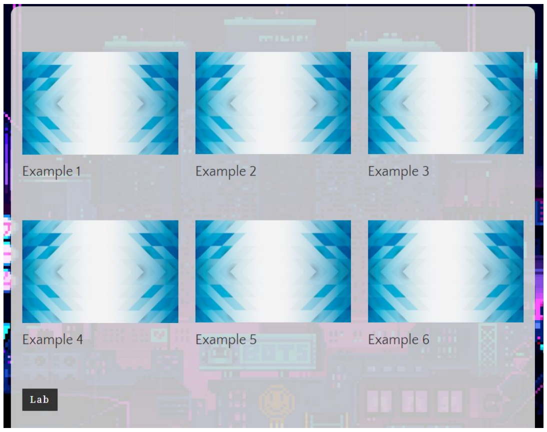


Figure 9: Tutorial examples screenshot

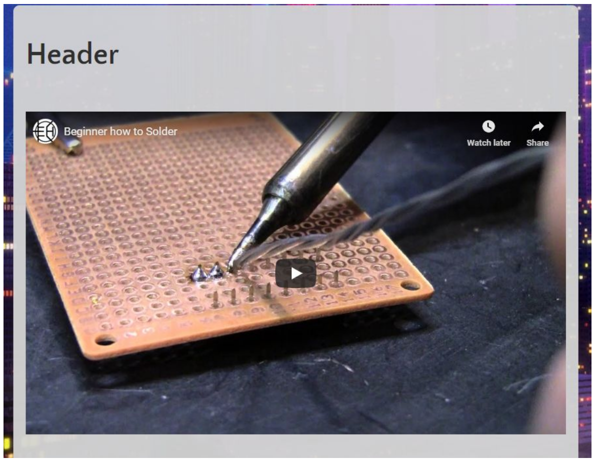


Figure 10: Header screenshot

They will be the format of videos since it is the most efficient way to transfer knowledge and enhance learning.

<u>Future:</u>

We are planning on adding even more examples with increased difficulty to enhance the learning, and create a better FAQ section for the examples.

Prototype 2: Activities:

Purpose: This prototype will function as a practical portion to the soldering course. Its purpose will be to provide insight into the user's soldering skills and if the soldering activity is consistent with the previous content. This soldering activity is essential for the soldering course and so working on it early will provide a fully realized activity.

Documentation:

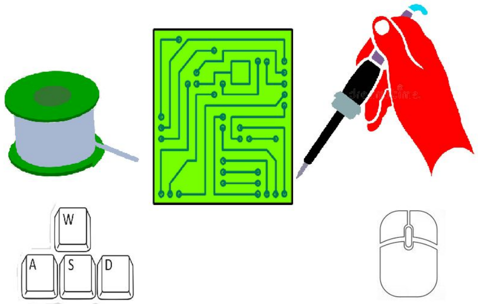
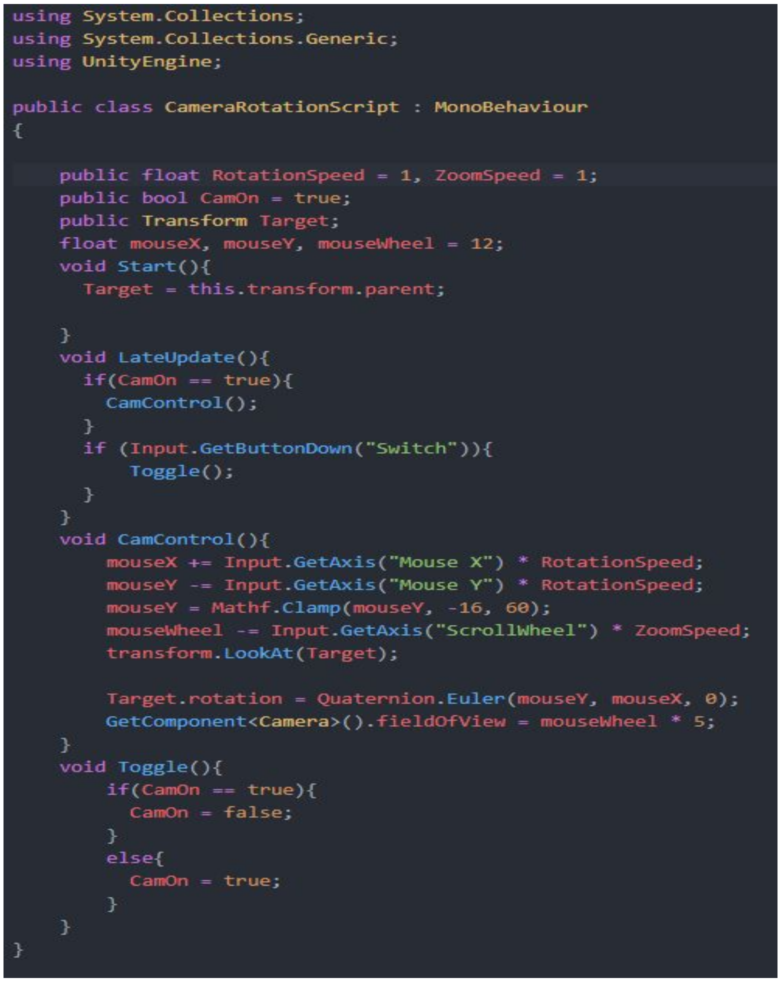


Figure 11: Conceptual Design

The activity section will be a program set in unity that will simulate soldering as seen above in Figure 11. In its current iteration, it has a very limited scope not allowing for full functionality, such as soldering different wires, surfaces, through-holes, different boards, etc.

Camera: The camera will allow for free movement around the soldering site. It will allow for a better view to accurately solder. The current iteration for the camera allows locking the camera’s movement when you press the e button and allows for the camera to zoom in using the scroll wheel. The scripts for these features are found below.

Progress:



```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class CameraRotationScript : MonoBehaviour
{

    public float RotationSpeed = 1, ZoomSpeed = 1;
    public bool CamOn = true;
    public Transform Target;
    float mouseX, mouseY, mouseWheel = 12;
    void Start(){
      Target = this.transform.parent;

    }
    void LateUpdate(){
      if(CamOn == true){
        CamControl();
      }
      if (Input.GetButtonDown("Switch")){
          Toggle();
      }
    }
    void CamControl(){
        mouseX += Input.GetAxis("Mouse X") * RotationSpeed;
        mouseY -= Input.GetAxis("Mouse Y") * RotationSpeed;
        mouseY = Mathf.Clamp(mouseY, -16, 60);
        mouseWheel -= Input.GetAxis("ScrollWheel") * ZoomSpeed;
        transform.LookAt(Target);

        Target.rotation = Quaternion.Euler(mouseY, mouseX, 0);
        GetComponent<Camera>().fieldOfView = mouseWheel * 5;
    }
    void Toggle(){
        if(CamOn == true){
          CamOn = false;
        }
        else{
          CamOn = true;
        }
    }
}
```

Figure 12: Camera controller script

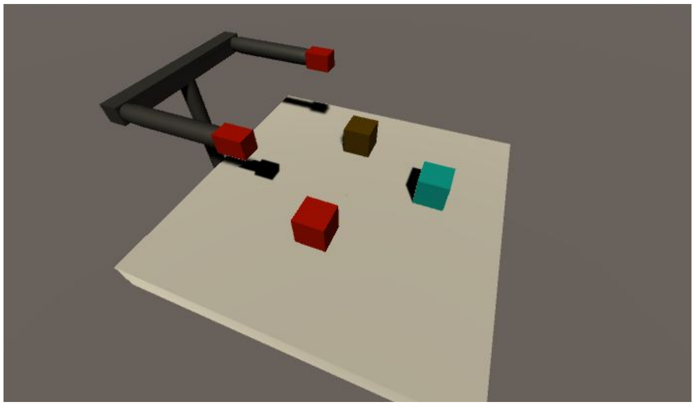


Figure 13: Soldering scene

This image shows the current soldering environment we have. In the back left, we have the first iteration of our helping hands that will hold in place that which needs to be soldered. It could not be found in the asset store so we will make one ourselves.

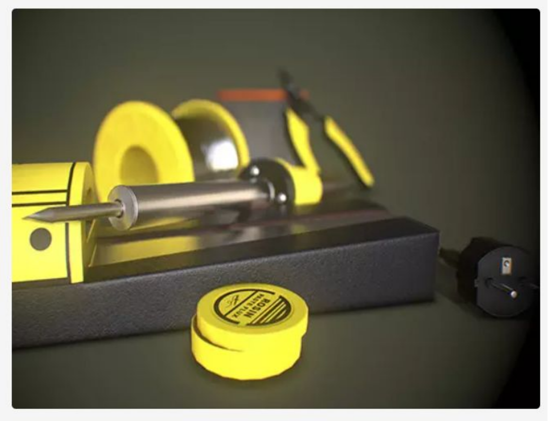


Figure 14: Soldering Iron asset

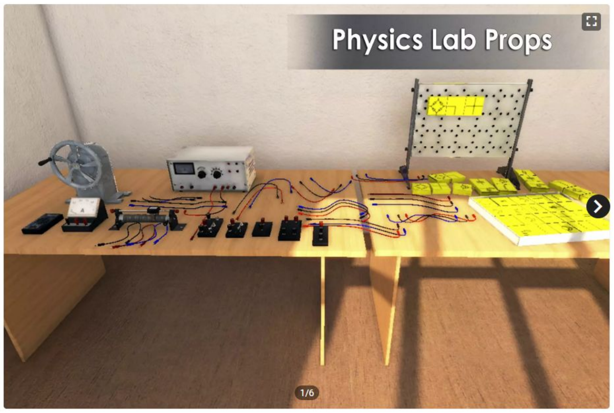


Figure 15: Physics Lab Props asset

Figures 14 and 15 show assets that will be used for the soldering activity.

<u>Future:</u>

Now we will work on the environment of the lab, an interactable hand that can be moved around by a mouse, interactable objects with the models, physical collision, smoke particles to represent fumes, and menu style notepad.

Prototype performance

Target Specifications	**Expected Results**	**Experimental Results**
Length of Workshop	**40 - 80 minutes**	**85, 80**
Effectiveness	**70% ~ 90%**	**75, 70**
Rating	**~3.5/5**	**3.5, 3**
Accuracy	**~3.5/5**	**4.5, 3**

Figure 16: Target Specifications table

Receiving actual results at this point in our project development process would not be ideal because the prototype is not yet ready to be beta-tested, the chart above shows results that have been tested by Z11 and feedback received from a pool of individuals we invited to review our product based on content that has not yet been implemented on the website.

Design day

On design day, we intend to present a fully functional, user-friendly website to provide a solid and useful introduction to soldering. Our product will be hosted on a Weebly website and will contain Unity activities (also presented on the website, no download necessary). The site will contain a basic overview of soldering and it's hazards, which will lead into the workshop material that will cover things in greater depth and will be presented in video tutorials/brief explanations and practiced in related Unity activities. Finally, the user will be tested and certified using MakerRepo, which will help us ensure that the user is gaining the necessary knowledge and benefitting from our product.

To ensure the solution properly works, we will analyze and evaluate our product in-depth based on the client needs to be sure that our product fits the exact needs of our client, as well as testing users to ensure that they leave our website with at least a beginner level knowledge of soldering and are capable of safely using materials, and finally, we will review based on feedback from our beta-testing, any future users, and our clients to ensure the best possible user experience that still provides useful information and learning. In conclusion, our final product should be a virtual alternative to a basic soldering workshop, that provides users with an engaging course and accurate information in order to learn to solder, and allows users to apply their new skills using short activities, all at no cost to the user and entirely through distance learning.

Conclusion

To summarize, this deliverable discusses the client feedback on our product up until this point in time, and how we intend to incorporate it into our product, as well as prototype testing based on our target specifications, our future prototyping plans, and what we expect to be able to present by design day. With our client feedback, we were able to reevaluate certain aspects of our current website in order to make it better geared to their expectations and to more efficiently layout the contents of the website. The analysis of our current prototype is less than ideal because we don't yet have a prototype ready for much user testing, so the results are based on our projections/opinions, as well as the feedback from a small number of outside users to somewhat gauge if we are moving in the right direction, however, we plan on doing much more testing and analysis once we have a working prototype for our activities. Over the next while, we will be working on making progress in our activities, in order to achieve our expected final product, which is a fully functional and interactive virtual soldering workshop, that will be presented on design day.