INF351H: Fall/Winter 2022-23

Design Reflection #2

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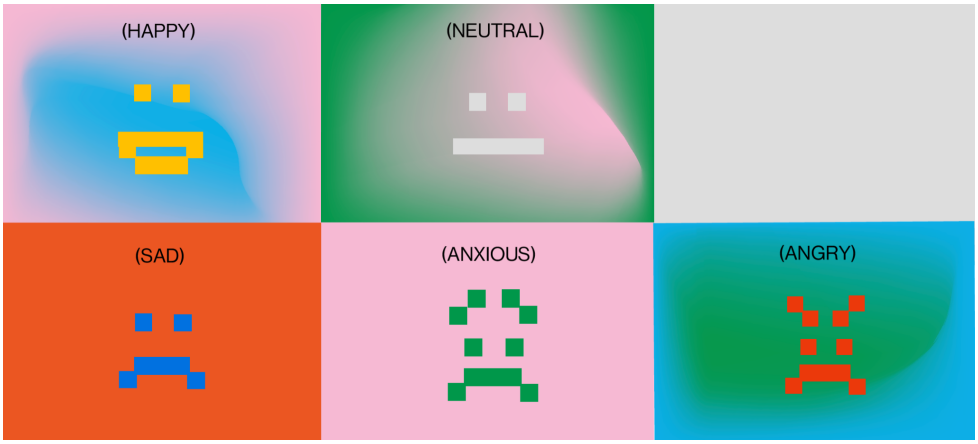
For the second project, a special-purpose household interactive machine was designed. To approach a multi-user design, the group started with brainstorming a machine for improving life quality of people in household. The machine should be responsible or beneficial for multiple roommates in the same household. House chorus assignments, at-home status, and feelings of each user at the moment were information we came up with for building the communicative machine. To achieve a more specific purpose, our group decided to focus on the emotional support features, facilitating mutual conversations in a way that requires less communication energy for its users. The foundational feature of the machine should allow its users to 1) set the status of their current emotions and 2) state whether they are available to support or talk to each other at the time emotionally.

Potential Users of the Machine

The target user group of the project is primarily young "Generation-Z" (GenZ: generation of people born between the mid-1990s - mid-2010s) (Collins English Dictionary) university student roommates who are often overwhelmed by stress, school workloads, and homesickness. These students, even though they desire emotional support from peers, might feel socially awkward and isolated to start an emotional conversation. The machine aims to help them express their feelings and availability to their peers more efficiently.

Interface and Program Design

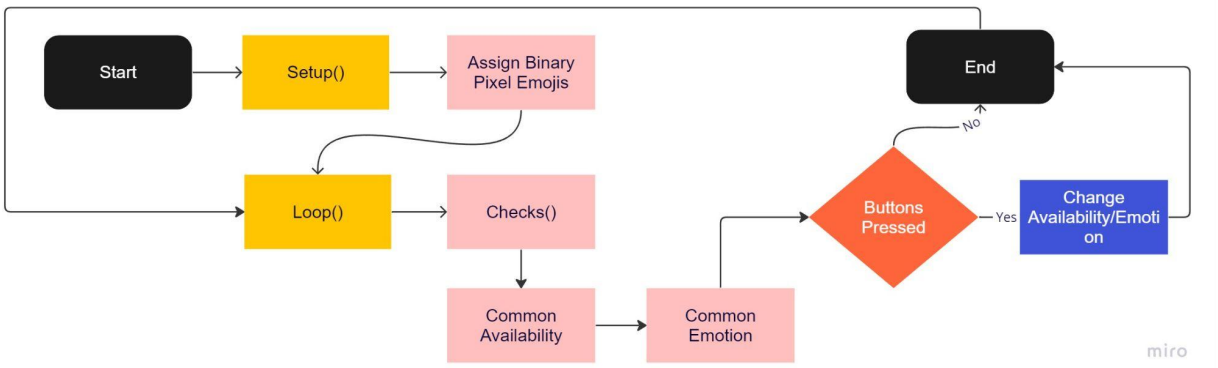
For the purpose of limited spaces on LCD for words and letters, we decided to do binary pixel arts to illustrate users' avatars, emotion status, and availability status. Arrays of eight bytes were assigned for each six by eight pixel emoji. In addition to the implemented emojis that represent five common emotions, an avatar emoji is created to indicate one user; a heart and a broken heart are used to represent whether the user is available or not available. Each digital drawing of the emojis is registered as individual characters by functions implemented for LCD screens, so we can show them on the screen similar to letters and numbers. Integer variables will be used to indicate each user's current status, allowing the machine to access the array to draw corresponding emojis based on button operations.



6 * 8 Pixel Common Emojis Used in the Machine

The actual coding design, compared to the last project, is more straightforward. Most operations are based on variable assignments and checking those variables' value by if statements and booleans. By default, there will be two users interacting with each other with their own buttons on each side. Ideally, more users could be added; however, only two users will be able to use it due to space limitations and demonstration purposes of the current project. The availability and emotional status will be stored separately for each user and will only be changed by the buttons on each user's own side. Once all the pixel emojis and defaults are set, the program will start checking whether users have status in common and whether a user has pressed a button. When one user browses through the available emojis, the program will keep track of the browse status, keeping the variables away from being off-bound.

When both users choose the same emotional state, GenZ slang will be presented according to the emotional states they have in common. The feature is included mainly for entertainment purposes, which can make users feel more connected emotionally as it follows the younger generation's trends. For instance, two happy users will see GenZ slang such as "Slay PURRR" on the screen. Due to the fact that university students often move more than once during their school years, user names can be changed manually in the Setup() section when desired. Furthermore, new emojis could also be added manually based on the user's preferences for future improvements.



Flowchart Demonstrating the Process of the Program

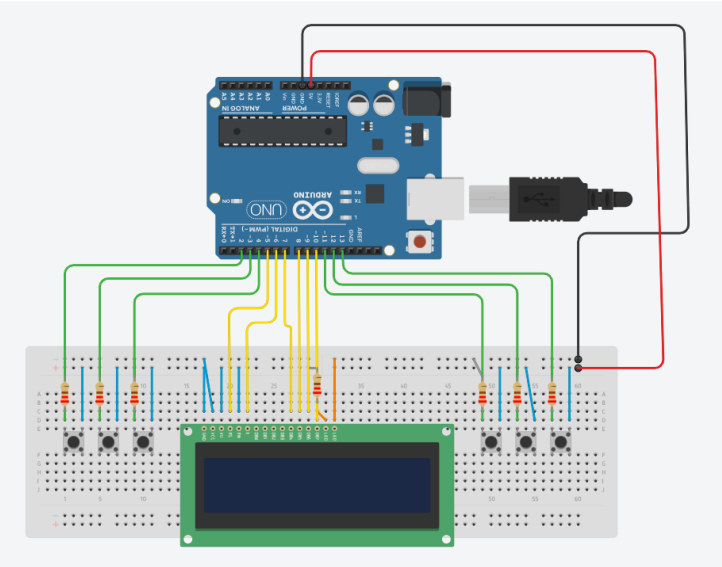
Layout of the LCD screen: it contains User names and availability status with avatars. The users' emotional status are set at the second line right beneath, with a potentially common GenZ slang in between.

Wiring The Broad: Buttons and HCI

Thanks to Jenny's longboard and wonderful insight regarding the fact that two parts of the board are disconnected, we were able to wire one LCD screen and six buttons in total for the machine. Having the LCD screen in the middle and three buttons on each side, we were able to provide a clean and self-explanatory board design where wires and the operations of the machine were straightforward.

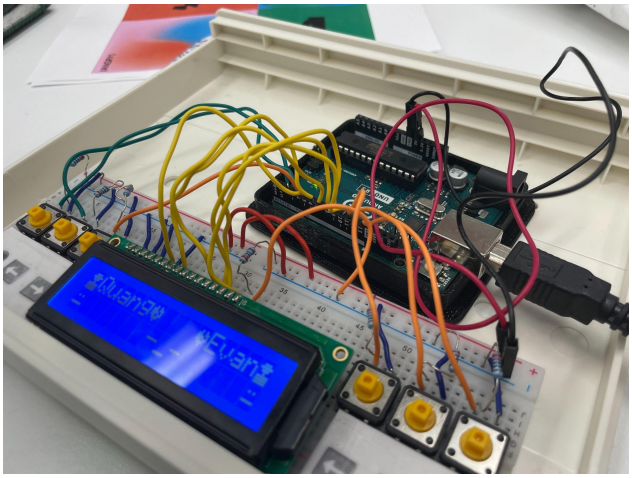
The preset of the three buttons, when brainstorming, was decided for 1) browse one way through the emojis, 2) confirm the emoji the user wants to set, and 3) change the availability status for each user. After writing the actual code, I found out that it is easier to change the

emojis without confirmation logically. Browsing through the list of emojis and waiting for the user to confirm will require an extra variable to keep track of the behavior; therefore, code-wisely and timewisely, it will be easier to drop the confirm button design. Initially, I considered removing the third button. After the modification, since having a list of emojis, I figured that allowing users to browse only one way could make the user experience frustrating. The third button was hence kept to improve the user experience, allowing users to browse both directions.



Arduino Broad Wiring Diagram

Other than button design and assignment, numerous approaches were made to improve the experiences regarding human-computer interaction (HCI). The goal of the decorations aims for a easy-to-use, self-explanatory, emotion-themed household computer. Our group booked an appointment with the iSchool's lab for 3D printing a base to enhance the board's stability, preventing it from moving around and thus possibly affecting the performance of the machine. Other than the 3D printed base, printed color poster decorations and cardboard cover the wires and other parts of the board, so that only buttons and the LCD screen will be shown to the users. The paper decorations includes the name of the machine and emotional expressions that will be avaliable in the machine. To make the operations of the buttons self-explanatory, small logos were printed and labeled for the buttons as well; users should be able to browse through the interface with ease.



3D Printed Base for Broad Stability

Cupboard Box and Paper Decorations

Reflections

Connecting back to the lecture materials, the machine is a specific-purpose computer; it is preset specifically for serving emotional support for university student GenZ roommates in the same household. The informational input of the machine is buttons, whereas the informational output of the machine is LCD (with availability and emotional status of the users). Both users are allowed to access the buttons simultaneously. Regarding code design, built-in functions IF statements and variable assignments were mostly used in the coding. Dictionary containing arrays of emoji and variable assignments for status play an essential role in creating the machine. To build the machine, an array of eight bytes (each byte contains eight digits, thus the size of the array was 8*8) was used to store six by eight binary digits that assemble each binary digital drawings. To store the emoji dictionary, an array was used to storing all the byte arrays. This particular array allows the programs to access and assign binary digits drawn emojis into LCD

formatted characters automatically. Having corresponding index numbers allows the machine to quickly set and browse through the required emojis and avatars. By using the array and functions, we successfully transfer the meaningless binary digits into semantic information, such as graphic representations of emotions (emojis).

Furthermore, the memory of our program is stored non-volatilely: the uploaded codes remain in the machine even though the power is turned off. We can immediately use the machine without uploading the codes again as long as the power is plugged in. This means that once we upload our compiled Arduino codes to the machine, they are stored in its ROM. This characteristic of the machine can be advantageous since it can be independent from any all-purpose computers after the compiled codes are uploaded.

For future directions, the machine should maintain its characteristic of serving a specific purpose, while having more implemented emojis, better decorations, and possibly installed on the wall or anywhere suitable in the household environment for improving HCI. The indicator of the availability might be confusing for potential users, thus, better digital arts or external plugins could be added. Moreover, since the machine does not depend on other computers once compiled codes were uploaded, it could be improved by adding implemented batteries and thus allowing it to be kept functioning without external electronic wires. At last, more users should be able to operate the machine, thus, a larger and more concise LCD screen is necessary for further developments. In addition to that, high resolution images can as well be used to replace the simple binary digital arts we have currently for the machine.

Bibliography

Generation Z definition in American English. Collins English Dictionary. (n.d.). https://www.collinsdictionary.com/us/dictionary/english/generation-z