

Alternative Input/Output

CSC 413

Pomodoro Pal

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Aim & Purpose of the Input & Output

The aim of this project is to design and develop a Tangible User Interface (TUI) that assists users in managing time effectively while applying the Pomodoro Technique during brainstorming or study sessions. The Pomodoro Technique is a time management technique that breaks work into intervals - usually 25 minutes - termed "Pomodoros," separated by short breaks to refresh and recharge. It is a technique to gain focus and productivity by exploiting pre-set periods of concentration also followed by rest.

My device uses an RGB LED to give it a physical and visual representation of remaining time in each session. This offers an intuitive display of the time progression without intrusion to the user; hence, during such focus periods, the LED would smoothly change from green all the way to red, whereas in breaks, it would transition smoothly from dark blue to light blue. These gradual changes in colour serve as ambient cues, reducing the need for users to check on digital devices that are often found to be sources of distraction.

The device intrinsically acts as a Tangible User Interface, which reifies abstract time intervals into a tangible form, appearing in the physical world to the perception and interaction of the user. In setting the timer and starting it up, the user interacts directly with the buttons of the device. This, compared with traditional screen-based interfaces, makes the interaction even more immediate and much more engaging. Such a hands-on approach follows the principles of TUIs, which bridge the gap between digital and physical by coupling digital information to physical objects or space.

This TUI is meant to keep people in their flow state without the interruptions that could come with having to use regular timers or smartphone apps. By externalizing time management into physical form, the device helps users to be more creative and focused in their work to achieve better productivity. Ambient visual cues allow users to remain focused on work yet subtly aware of time passing; hence, better time management can be achieved without diverting attention from the task.

Motivation

The motivation to develop the Pomodoro Pal is derived from the common challenges faced by people to effectively manage their time during focused tasks such as studying or brainstorming. In this modern-day digital era, lots of users fail to stay focused on their tasks because of being distracted by various gadgets such as smartphones, computers, among other digital materials. This is mostly because of notifications, social media, and the urge for multitasking that causes disruptions, leading to low productivity and efficiency.

The Pomodoro Pal addresses this challenge through a more physical and minimal interface that minimizes the use of digital tools, which might be distracting. Integration of the Pomodoro Technique-a method of managing time that generally encourages users to work in ultrashort sprints, granting them fairly frequent short breaks-allows the device to guide users through structured work sessions.

The project falls within the little-c category of the Four C Model of Creativity: everyday creative acts and problem solving that improve one's quality of life. Not revolutionary from a societal perspective, the Pomodoro Pal reimagines personal time management by providing a different and non-invasive means of output. An RGB LED provides an unobtrusive, ambient indication of elapsing time using smooth colour transitions, without screens and audible notifications.

For the end-user, this eliminates interaction with smartphones or computers for tracking time and hence minimizes distractions. The physical LED interface gives the user a gentle reminder about work and break periods, enabling them to keep their focus and build better study habits. By ending burnout with no interruptions but sole focus, the Pomodoro Pal increases general efficiency. These little-c creativity practices leave a noticeable mark on the daily users in managing and maintaining time effectively for support of creative work.

Design and Implementation

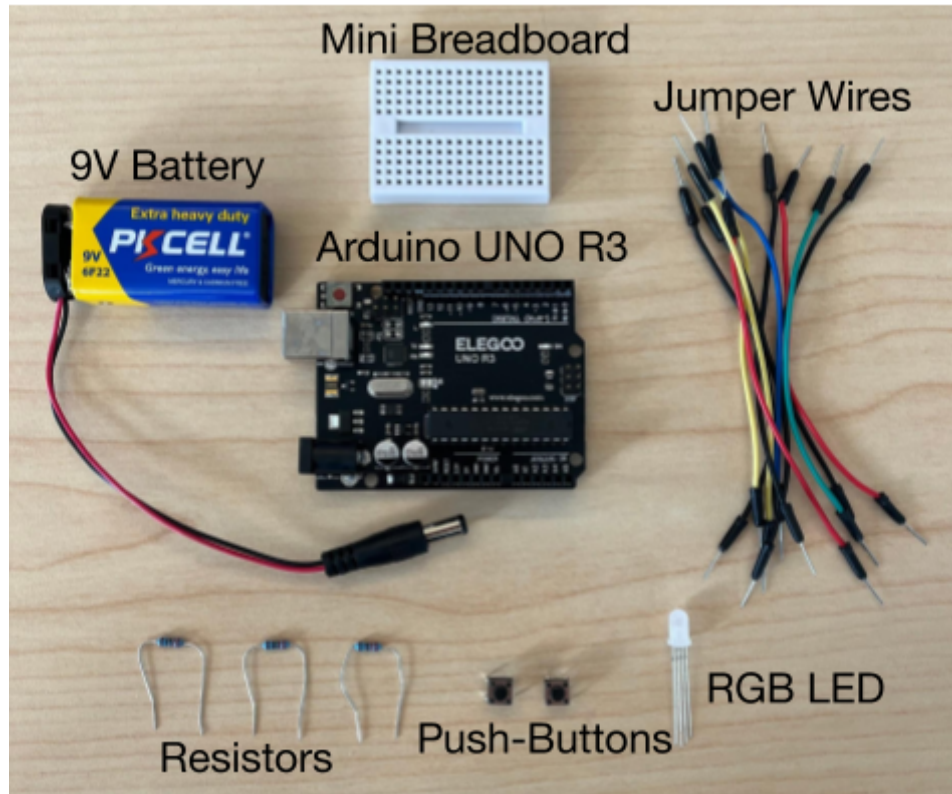
Parts of the System

The Pomodoro Pal consists of several important parts that work together to help you stay focused. Here's a breakdown of how it works:

- **Arduino UNO R3:** This is the heart of the system, managing the timer and controlling the RGB LED to keep you informed about your study session progress.
- **RGB LED:** Instead of relying on a screen, this light changes colours to let you know if you're in study mode or break time, and even shows how much time is left with smooth transitions.
- **Two Push-Buttons:**
 - **Increment Button:** You can easily set how long you want to study by pressing this button to add 5 minutes of time.
 - **Start Button:** Once you're ready, hit this button to start your session.
- **Resistors (220Ω):** These small components prevent the LED from getting too much power, helping it last longer.
- **Breadboard:** This serves as a convenient platform for assembling the electronics, it keeps everything organized and lets you make easy adjustments.
- **Jumper Wires:** These act as electrical "roads" that connect all the components so they can communicate effectively.

- **9V Battery:** This powers the entire system, making it portable and easy to use.

In short, the Pomodoro Pal is simple but effective - everything works together to help you stay on top of your study sessions without distractions.



Rationale for Design Choices

1. RGB LED for Visual Feedback: The selection of an RGB LED as the primary output component is central to the project's goal of minimizing distractions. The LED's changing colours serve as a clear, yet subtle, way to show how much time is left:

- **Time Progression:** As you study, the LED slowly shifts from green to red. Green means you've got plenty of time, yellow is the halfway mark, and red warns that your session is almost up.
- **Breaks:** During your break, the light shifts from dark blue to light blue, signaling it's time to relax, without the need for any loud noises or distracting screen notifications.
- **Minimizing Distractions:** The soft glow is an easy reminder to stay on task, so you're not constantly checking your phone or other screens.

2. Physical Push-Buttons for User Input: Utilizing two physical push-buttons simplifies user interaction:

- **Tactile Experience:** Physical buttons offer immediate feedback, improving the user experience compared to touchscreen or soft buttons.
- **Straightforward & Reliable:** Mechanical buttons are straightforward, unlikely to break, and great for anyone who doesn't want to deal with a complicated interface.
- **Avoiding Complex Interfaces:** Keeping the interface simple with just two buttons ensures that the device is easy to use and accessible for people of all ages and tech skill levels.

3. Minimalistic Design Philosophy: The whole design is built on simplicity:

- **Focus on What Matters:** By keeping only the essential features, the Pomodoro Pal helps you focus on time management without overcomplicating things.
- **Easy to Build:** Using a breadboard and jumper wires means it's simple to put together, and others can easily recreate it if they want.
- **Affordable:** With fewer parts, the cost stays low, making it accessible to more people.

In summary, every part of the design is aimed at creating a simple, affordable, and distraction-free way to help you stay focused and improve creativity.

System Operation

The Pomodoro Pal makes managing your study sessions straightforward and effective by following these steps:

1. Setting the Study Time:

- To begin, the user presses the first button to increment their study time. Each press adds 5 minutes, with a maximum of 60 minutes. The RGB LED flashes in cyan to confirm the selection, so the user knows it's set.

2. Starting the Timer:

- After the user has chosen their study time, they hit the second button to start the timer. The RGB LED turns green, signaling the start of the study session. As time goes on, the light changes from green to red, giving the user a visual cue of how much time they have left without needing to check a screen.

3. Tracking Time with Colour Changes:

- The Pomodoro Pal keeps track of how much study time has passed and changes the RGB LEDs colours to reflect that. As the study time decreases, it changes from green to yellow and then to red, giving the user another visual cue of how much time remains.

4. Transition to Break Time:

- When the study time is up, the device signals the end of the session by flashing the red LED. It automatically calculates the user's break time - one minute for every five minutes of study. During the break, the LED changes from dark blue to light blue, showing the user how their break is progressing.

5. End of Break and Reset:

- Once the break is over, the system flashes the blue LED to let the user know it's the end of the break. It then resets, turning off the LED and getting ready for the next study session.

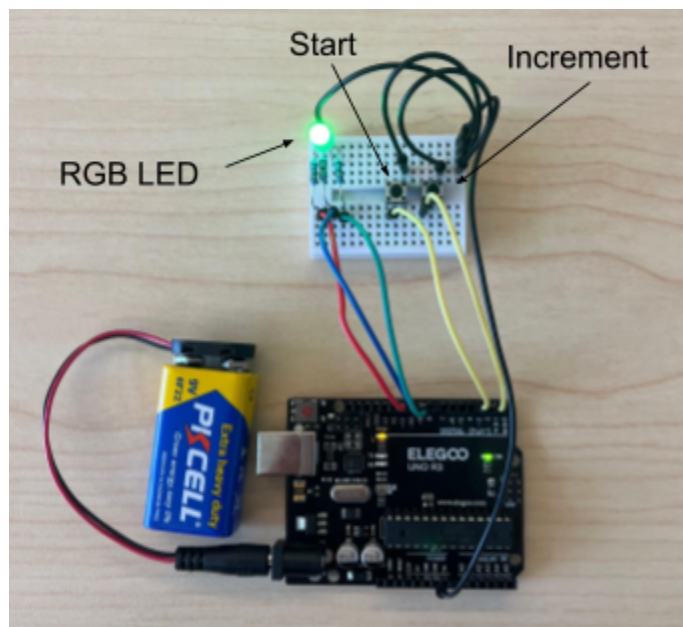
Software Code

The code for the Pomodoro Pal can be found in this [GitHub repository](#). The code is well-commented and easy to follow, with clear explanations for the logic behind the timer calculations, colour transitions and user inputs. It was developed using TinkerCad/Arduino IDE.

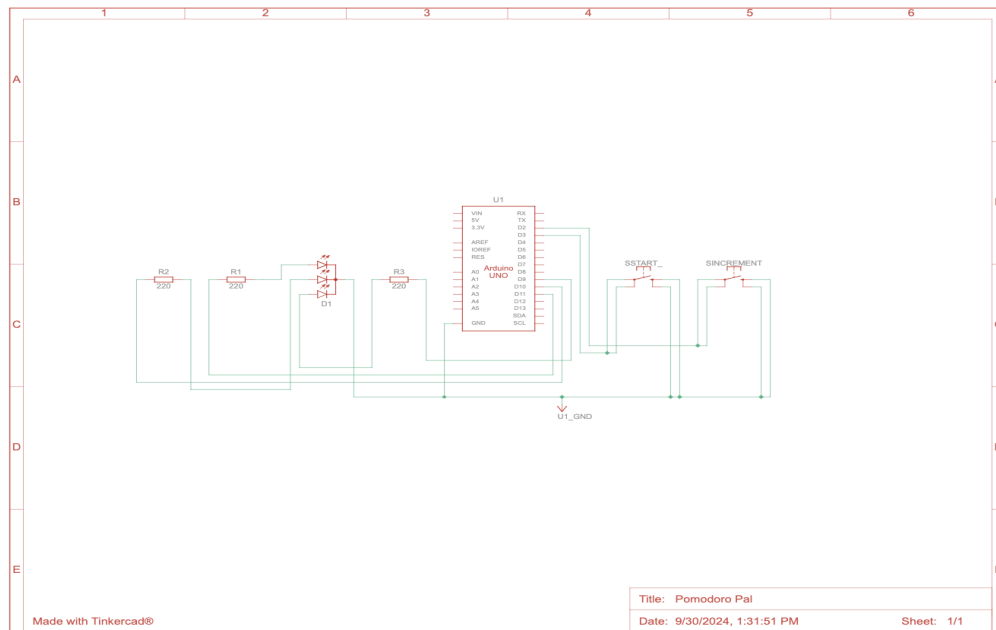
Images and Screenshots

Below are images that illustrate the system:

1. Pomodoro Pal:



2. Circuit Diagram:



The Pomodoro Pal consists of the Arduino UNO, the RGB LED, and the two push-buttons connected via a breadboard. The circuit diagram shows how the components are connected. The Pomodoro Pal Tinkercad link can be found [here](https://www.tinkercad.com/learn/circuits?collectionId=OMOZACHJ9IR8LRE).

References

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These resources provided inspiration and guidance during the development of my Pomodoro Pal, particularly in the use of TUI and simple electronic components.