Prototype Design and Evaluation Plan

Group 5: Muted

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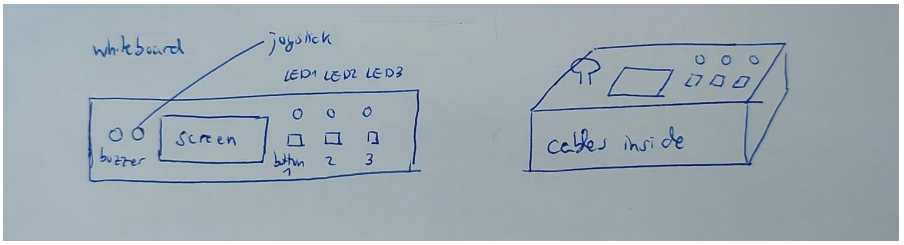
Potential designs

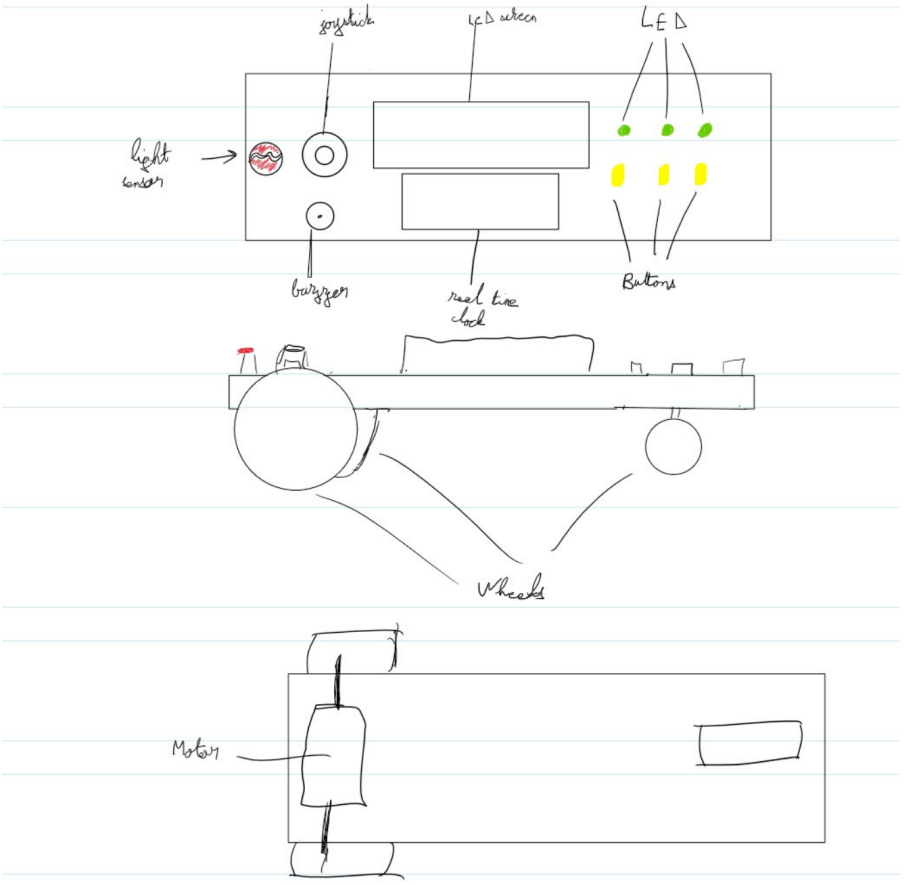
The group decided that it would be a good idea for each member to propose a robot design so that we can later on choose the one we like the most. We believed that brainstorming many potential designs could lead to a more creative robot design since we could mix some ideas together.

Firstly, we went through the Arduino kit box provided in class. There were many components that we were not familiar with, so we did some research to see if they can be useful for our robot idea or not. While some ideas are still in the air, we believe that we will be using the following components:

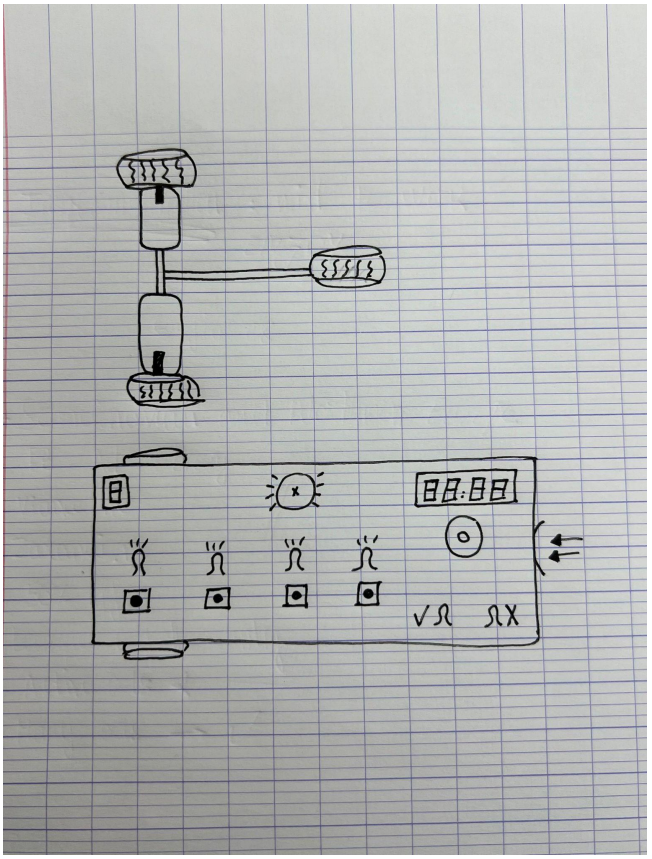
- Buttons: the user will press them in a sequence given by the robot. There are up to 5 buttons in the kit, but we are thinking of only using 3 of them for the moment.
- LEDs: one LED is needed for each button; they will be placed next to them and they will light up in an orderly manner so that the user can know the correct sequence to put in.
- Joystick: user will use the joystick to navigate through the screen and set his alarm.
- Text LCD: the screen on which all the information will be written: current date and time, alarm time set by the user, streak count, statistics recorded…
- Buzzer: there are two buzzers available in our kit: an active buzzer and a passive buzzer. After googling the differences, we found out that the active buzzer can only produce a single tone, while the passive buzzer can be triggered to produce different tones. Thus, we believe that we will be using the passive buzzer in order to create the alarm sound to wake the users up.
- CDS: this sensor will check if the user has turned on the lights of his room after turning off his alarm. It is assumed that the user will turn on the lights when they actually wake up and that will actually test the efficiency of our prototype.
- Step motor + wheels: they will be used in order to move the robot. We're not sure if we will actually implement these components in our project or how we will do it if we decide to add them to the robot.



In the first preliminary sketch, no wheels have been taken into account. The robot will take a rectangular shape mainly due to the shape of the breadboard we're using. The idea is to assemble all the circuits inside the robot, and then all the interactive components will be displayed face-to-face with the user.



In the second sketch drawn, we still have the basic same design with the same components used but the difference here is the addition of wheels in order to put in place the motion mechanism we talked about as a team. Two wheels at the back are operated by one step motor in the middle that coordinates their rotation.



For the third and final sketch, we still had the same design approximately as the other drawings but a different distribution was set for the interactive components with the users. The wheel structure here is different too: two step motors are used, one for each wheel. Moreover, a new idea is added to the robot which is a 7 segment LED screen that could add a gamification part for the project which is adding a score and keeping track of a streak for the user in order to measure the robot's efficiency and the user's adaptability to it considering he is seeking more energetic new habits.

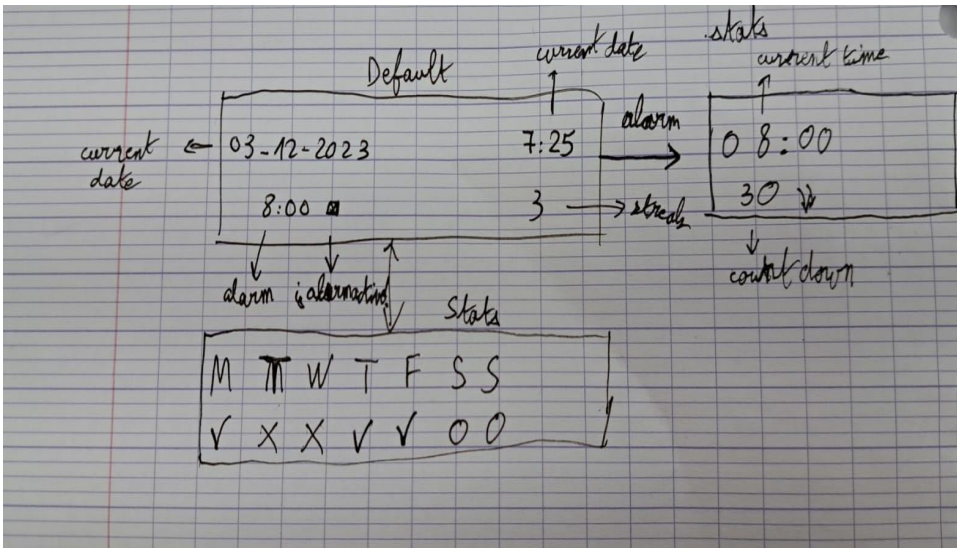
Final Product Design

For the overall design of the robot, we're going to stick with the idea of a rectangular form helping us use the breadboard without having issues. For the distribution of the components, it will depend on our ability to connect them to the arduino with the right ports so it will be on-the-spot decisions.

For the motor and the wheels, we talked about it as a team and have decided to remove this part from our project and put more options on the interaction part between the user and the LCD screen, because moving the robot could get complicated afterwards and we didn't find a real use of the movement in this alarm clock.

Regarding the information that will be shown on the screen, the user will see the following. Firstly, we have a default screen that will display the current date and time, the alarm time set

by the user as well as the current streak count. The streak count is a method we created to gamify the robot; people can keep track of their timed set-off of the alarm and know how long they've been succeeding in waking up on time. Secondly, we have the alarm screen that appears instead of the default screen when the alarm time arrives and the buzzer starts making sounds. It contains the current date and time as well as the countdown clock. This countdown clock we implemented gives the user a specified amount (~30 seconds) to put in, by using the buttons, the combination given by the robot. If succeeded, the count streak is incremented and we go back to the default screen. Thirdly, we have another screen that demonstrates past successful and unsuccessful days during the week. The format we'll be using would have this form: M (V) T (V) W (X) T (X) F (O) S (X) S (V). Each day of the week is represented by its first letter, V represents success, X failure, and O absence of alarm. The switching between the default screen and the success screen is done by the use of a joystick, moving upwards or downwards. For setting, editing or deleting the alarm, users will have to press on the joystick to enter "alarm" mode. The LCD screen will point at the alarm time on the screen. Users could afterwards change the alarm by moving the joystick properly and then press it again to confirm. In order to delete the alarm, you'll have a little box or icon at the end of the alarm time that you could press. Below is an example scratch we did to clarify the design of the LCD screens.



Weekly work plan

Thursday Nov 2:

- Prototype Design and Evaluation Plan DUE DATE
- Start of the building process while trying to test all the components and put them together.

Thursday Nov 9:

- Start to effectively connect components together and plan what to add or change in the design if necessary while deciding what other components should we bring before the next meeting.

Thursday Nov 16:

- Start with the programming part of the project so we can test the components that we put together and see if they work out well and they are well connected.

Thursday Nov 23:

- Get advanced in the programming part and start wrapping up code details and requirements before the deadline arrives.

Thursday Nov 30:

- Finish the programming of the robot and its construction based on designs already agreed on.

Thursday Dec 7:

- Checking all the documentation needed for the end project as well as finalizing the robot while trying to embellish the design with decorative parts if in advance.

Thursday Dec 14:

- Final Presentation DUE DATE

Friday Dec 15:

- Final Project Report DUE DATE
- Digital Portfolio DUE DATE

Final evaluation plan

On a personal team level, we have to check ourselves for the quality of the robot we're designing: all components must be effective and work in a predefined way like the LCD screen or the buzzer for making the alarm sound… We'll try testing each component alone when putting them in place on the robot so that we can keep track of potential complications we could face on the way.

Afterwards, one other method discussed within the team for evaluating the robot's performances was to survey some test users after finishing building the robot or just a kind of prototype. With that, we could receive honest and extensive feedback to look through the quality of the HRI and design. Each team member would have to select a number of users from his entourage as a tester. Participants will have to test the robot and fill out a google form filled in with some prepared questions. Some example questions are:

1. On a scale of 0 to 10, how would you rate the overall performance of the robot?
2. On a scale of 0 to 10, how visually appealing is the robot's design?
3. How has the robot positively impacted your daily life or work processes?
4. Can you describe any challenges or issues you've encountered while using the robot? Please provide suggestions for improvements or additional features you'd like to see in future robot versions.

5. On a scale of 0 to 10, how much would you recommend this robot to others based on your experience?
6. Is there anything else you'd like to tell us about your experience with the robot?