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An Interaction Design for Improving User Experience with the Health Protocol of COVID-19 Pandemic in Indonesia

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ABSTRACT

COVID-19 is a disease that has spread throughout the world and is transmitted through inhalation or contact with droplets of infected people. The Indonesian Government has established a health protocol to reduce the spread of COVID-19, which is checking the body temperature of visitors at public places. The officers' representatives from public places are mobilized to check the body temperature of the visitors by bringing the thermometer closer to the forehead or hand of the visitors. This paper aims to design a contactless thermometer using an Arduino Uno by adding an interactive design and light installation. It aims to enhance the user-experience rather than the design idea itself. The thermometer will move a mechanical flower adjusted by the temperature measurement with this product design.

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1. INTRODUCTION

The world has been hit by a pandemic COVID-19 virus (SARS-CoV-2) in the last two years. This condition leads to the emergence of a new routine to adjust to various aspects of life. One of them is the effort to comply with health protocols. For example, based on the PERMENKES (2020), the regulations set for shopping centers/malls/shops are to check body temperature of the visitors at all entrances. Because these places are the center of crowds and movement of people, this anticipation is carried out. The health protocol, which was initially implemented, made people feel overwhelmed, but now it has become a routine that cannot be separated from our daily life.

Implementing COVID-19 prevention and control efforts in shopping centers/malls/shops requires the role of managers and the involvement of cross-sectors and officials in controlling community discipline. Temperature checkers must wear masks and face shields, and this activity is also recommended to be accompanied by security officers. The temperature measurement itself needs to be held at all entrances of the shopping

center. If a worker or visitor is found with a temperature > 37.3°C (2 checks within 5 minutes), that person cannot enter.

However, the implementation of body checking temperature is considered not effective because most of the checking process is still done manually by the officers at a close distance with the visitors. Over time, a contactless thermometer was created so that temperature checks can be carried out without meeting face to face with temperature checking officers.

Nevertheless, many still violate and do not comply with health protocols. According to the Ministry of National Development Planning or BAPPENAS (2021), a communicative approach is needed to develop innovative engineering elements from a creative technology perspective. Therefore, an idea to create an automatic and interactive contactless thermometer to improve the user experience to encourage changes in people's behavior is proposed. Contactless thermometers usually show only the measured body temperature on the LCD screen. The proposed idea is to add a loudspeaker feature and design the whole system through an interactive approach. It is hoped that with this the improved contactless thermometer, the new normal routine becomes positive and feels entertaining to live.

The product's shape can give rise to various psychological responses from consumers (Bloch 1995). Perception of the shape of a product can evoke some affective and cognitive responses. In some cases, the product's shape can cause a positive response, such as a simple liking, or evoke a more robust aesthetic. The product's shape can also influence beliefs related to characteristics such as durability, technical sophistication, and ease of use.

Designers need to pay attention to the product design, and the product also needs to highlight its usability and effectiveness in terms of aesthetics. The lack of products that have been created previously is the basis for the increasingly rapid development in this modern era. With the development in technology, for example, people make thermometers due to the spread of fever and other infectious diseases.

In general, thermometers that are often used to measure human body temperature are divided into two: analog and digital. These two thermometers that are often used to measure the body temperature are at a higher risk for use by everyone because they require direct contact with the user, and if used interchangeably, they will be at risk for a larger scale of people. Some thermometers use mercury, which is riskier because the mercury will be toxic to humans if the tube breaks. In that case, contactless thermometers can be used everywhere, such as ordinary places, risky places, or public places like malls.

A user is a human who is targeted to utilize a product. All feedback that the user feels is called user experience. User experience is multidimensional, including affection/ emotion, enjoyment/ fun, aesthetics/ appeal, hedonic quality, engagement/ flow, motivation, enchantment, and frustration (Bargas-Avila and Hornbæk 2011). In another definition, user experience arises between human and product relationships with their respective perceptive and responsive capabilities. This capability can be overcome by-product and interaction design (Djajadiningrat, 2004).

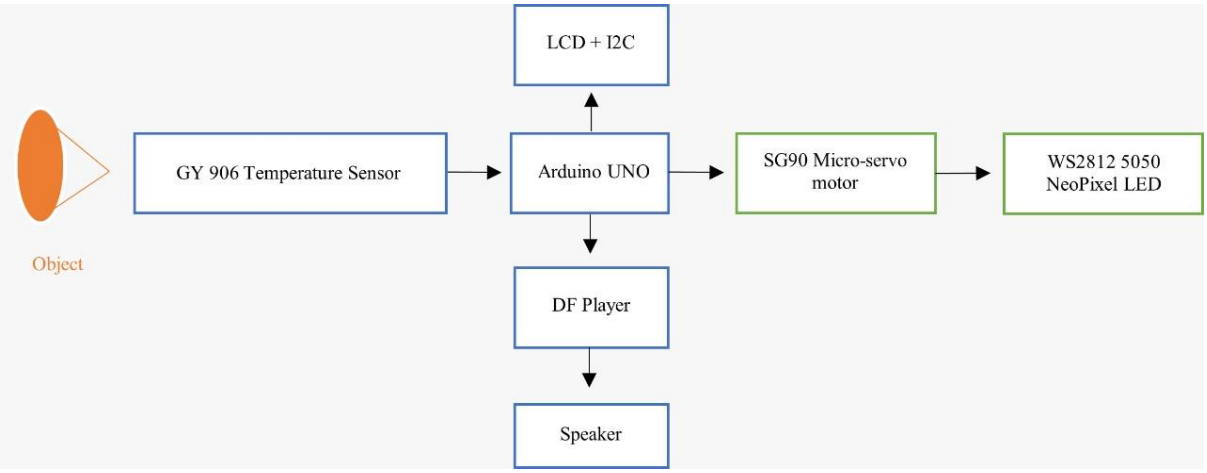

Figure 1. The flow of connected components.

Behavioral changes caused by new routines also affect how users interact with the product. Psychological states are the leading cause of how the user's sensory input and motor output respond along with the circumstances in the surrounding environment. The user learns to understand the object and interact with it. Similarly, 'new' technologies have disrupted the creative process of arts and media production, but no common professional practice seems to have drastically changed. The dynamically developing technologies influence creative arts and media practitioners, and the big issue is that they accepted every media technology innovation unknowingly, everything is normal, but every change leads to a new normal (Harditya, 2019).

The change in routine impacts the user's psychology, like looking for new things. This impact can be used to promote health protocols in this pandemic era. There needs to be a spark where the rules that are considered very tiring and feel heavy to be carried out so far become exciting things. The answer is to promote interactive and visually appealing designs. Not only supports user enthusiasm, but the interactive design also helps users become accustomed to new environments. According to (Harditya, 2019), audio and visual have gone through many media evolutions that contribute to media communication in the form of creative innovation that inspires people in producing creative deliverables. Evidence is apparent through the creation of audio-reactive production, where visuals and audio are performed in an automated process. Therefore, this interactive design is also categorized as an audio-reactive installation.

2. RESEARCH METHODOLOGY

The diagram shown in **Figure 1** describes all the equipment connected. First, the GY 906 temperature sensor reads the data from the body or object. Second, the data received from the sensor will be sent to the Arduino Uno, which will process the data from the sensor. Finally, the system displays the results (temperature read) through the +12C LCD. Meanwhile, the DF Player will automatically read the detected temperature results. This temperature reading also automatically commands the Micro SG90 servo motor to move. However, there are indicators of how the motor and the WS2812 5050 NeoPixel LED will work. The indicator depends on the temperature range of the human body. The WS2812 5050 NeoPixel LED operating system will turn on the blue light when it de-

tects normal temperature (<37.5°C) and red for above normal temperature (>=37.5°C).

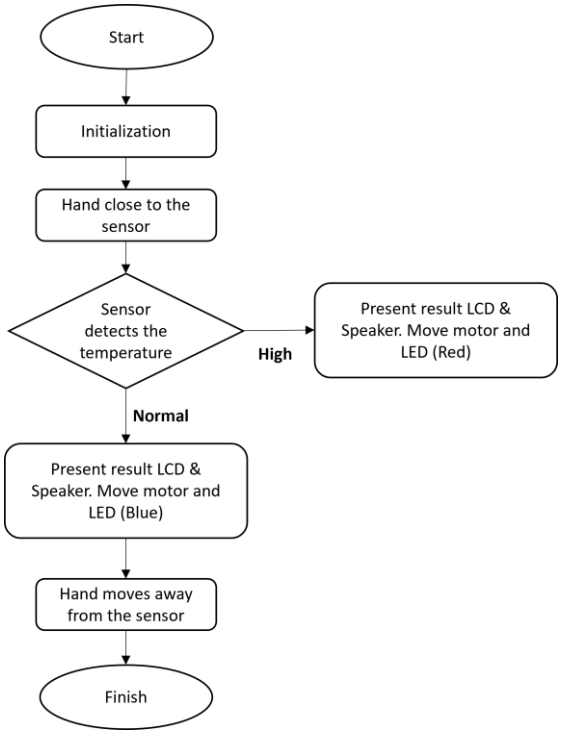

Figure 2. The flow of the program.

The contactless thermometer is designed to be easy to use when taking temperature measurements. Users only need to bring their hands closer to the prototype device (around 5 cm from the device). When the power button is pressed, the voltage will enter all circuits. After that, the Arduino Uno will start to initialize the program and then display the tool's instructions on the LCD. When the hand is approached, the sensor will detect infrared radiation emitted by the object. The data obtained from the sensor will be processed into temperature quantities by the Arduino Uno, then it will be displayed on the LCD, and the DF player will read the detected temperature value. After that, the device will process whether the temperature is in the normal range (<37.5°C) or not (>37.5°C), which determines the movement of the motor and the color of the LED that will light up (blue is the average and red is abnormal). The program flow chart can be seen in **Figure 2**.

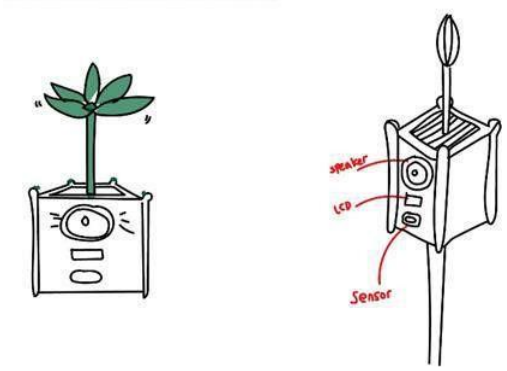

Figure 3. The design sketch of the product.

The thermometer installation will be designed based on the condition of the room or public places (such as malls/ colleges). The open-source 3D design model being used was inspired by Jason Suter's engineer. By changing the design of the flowerpot that is adjusted to the sensors, LCD, and speakers used in this project, the design sketches and ideas are shown in **Figures 3** to **5**. **Figure 3** shows the design sketch of the product, **Figure 4** shows the installation sketch of the product, and **Figure 5** shows the electronic diagram.

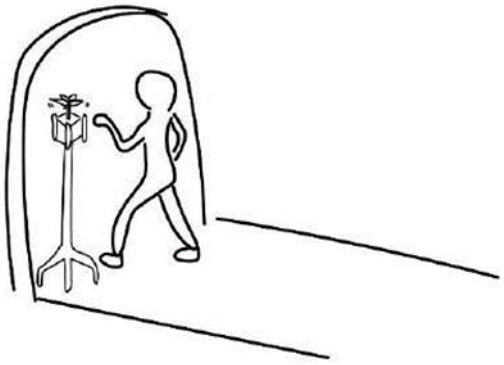

Figure 4. The installation sketch of the product.

The blooming flower design signifies thriving health, which is also in combination with blue LED color, the original idea is adopted from a DIY design project from Suter (2017). This design is also built to be modular, which means it is designed as a small part of a more extensive interactive installation. It can be built smaller in size, but higher quantity. Thus, modularity can

potentially enhance its user-experience value. This article also includes a universal insert that mounts any standard tripods, extending its modular capability.

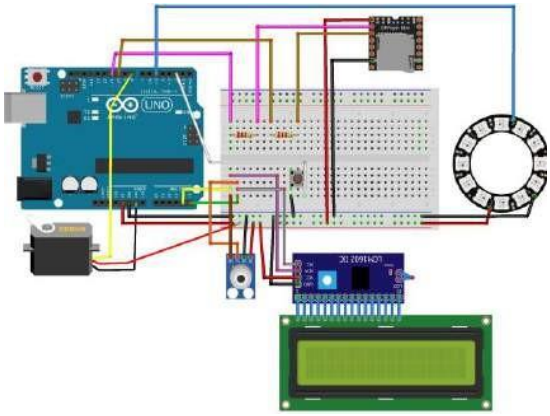

Figure 5. Micro-controller connection of the interactive flower petals.

3. RESULTS AND DISCUSSION

There are still many obstacles in the assembly process in achieving the desired product. However, along with the debugging process, a problem was found in installing components with the Arduino microcontroller. However, the installation process did not find any problems in integrating components with 3D printing.

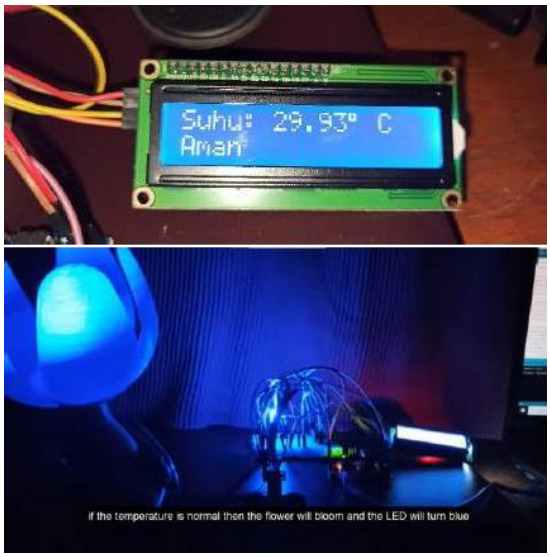

Figure 6. Normal Temperature

The following is the result of a contactless thermometer that is operated automatically via a laptop or PC. The tool is designed for the front gate of public places, such as malls, campuses, and others. The thermometer will work if the object is detected within 5 cm with the ultrasonic sensor located in the flowerpot. The result displayed on the LCD screen will show the number of degrees measured and an indication of whether it is normal or not. The display on the screen is shown in **Figure 6** and **Figure 7**.

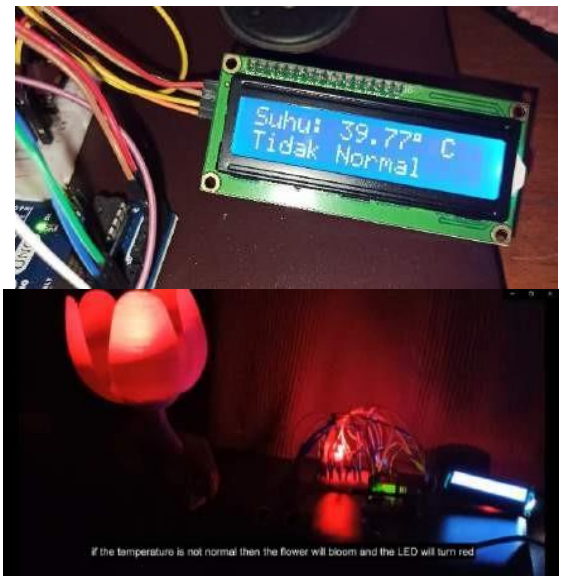

Figure 7. Abnormal Temperature

Continuously, the servo in the pot will move the flowering mechanism (whether to open or not). For temperature detection of more than 37.5°C, the flowers will not bloom, and the light will be red (**Figure 7**). Conversely, if the temperature is less than 37.5°C, the temperature is declared normal, and the flowers will bloom and show a blue light (**Figure 6**). More details can be seen through a video that can be accessed by scanning the QR code (**Figure 8**).

Figure 8. QR code to the video prototype

4. CONCLUSION

The end of the pandemic is still unpredictable. Two years have passed, and people are starting to accept the new normal in their daily life. This circumstance is the reason for the emergence of developments in technology. Developments in technology are tools that make it easier for society to adjust to its new routine. Therefore, the development of this automatic contactless thermometer aims to improve the user experience by making interactivity in this design a solution to develop public interest and making the new normal a fun experience. There are still many shortcomings found in the development of this tool. This product can still be developed for future research, such as making this product portable and ergonomic. In addition, the implementation of the interactive contactless thermometer in public spaces has not been done yet due to the space and time limitations of the pandemic, and this will be done in future research.

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