

#Title

Profile Based Shower Head

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Problem

Sharing a shower with multiple individuals can often lead to conflicts and difficulties. One common issue is the inability to remember the desired position or temperature settings of the showerhead. Additionally, some individuals may have difficulty determining their preferred temperature due to the challenges of adjusting the knob. Another group who may encounter issues with the showerhead are those who are disabled or of shorter stature, as they may have difficulty reaching and adjusting the showerhead to their liking.

Solution

Our objective is to address some of the challenges associated with shared shower spaces by designing a showerhead that can save and recall individual user profiles. This includes information such as preferred showerhead position, water temperature settings, and average shower duration. By saving this data for each user, we aim to enhance the shower experience. For instance, by selecting a user's profile, the showerhead can automatically adjust to the last recorded position for that user. Additionally, our showerhead design would allow users to view the current water temperature and their preferred temperature setting. By learning the average shower time for each user, the showerhead can also encourage water conservation by suggesting shorter shower durations. Our showerhead would incorporate various elements such as sensors for detecting shower head position and water temperature, motors for positioning the showerhead, a controller for managing profile data and shower head movement, a display for displaying profile information and water temperature, and a sturdy physical structure suitable for most shower setups.

Solution Components

Subsystem 1 (Sensor Subsystem)

Explain what the subsystem does. Explicitly list what sensors/components you will use in this subsystem. Include part numbers.

The Sensor subsystem will consist of an accelerometer to collect data on the position of the showerhead in relation to Earth's gravity, a temperature sensor to measure the temperature of the water flowing through the shower head, and a water flow sensor to detect if the shower is on so we can measure the shower duration. The sensor subsystem will also consist of a communication device to communicate with our remote control subsystem and send the data acquired from the sensors. These sensors will all be placed in the physical subsystem in a separate compartment to avoid water leaking into the sensors.

Accelerometer: ADXL345

https://www.amazon.com/Adafruit-ADXL345-Triple-Axis-Accelerometer-ADA1231/dp/B01BT4N9BC/ref=sr_1_6?keywords=accelerometer&qid=1674700283&sr=8-6

Temperature Sensor: DS18B20

<https://www.sparkfun.com/products/11050>

Water Flow Sensor: 1597-1516-ND

<https://www.digikey.com/en/products/detail/seeed-technology-co-ltd/114991177/7387420>

Subsystem 2 (Positioning Subsystem)

The showerhead will also have a motor to add 1 rotation axis to the shower head to position it to the user's preference. This motor will attach to a joint in the shower head and move the joint up when rotated one direction and vice versa to move it down. The chosen motor will have high torque and very low speed so that customization for the user is easier. Our option for a motor is the DC motor as it has a high starting torque.

Motor: JGY-370

https://www.amazon.com/Bringsmart-Turbine-Electric-Self-locking-JGY-370/dp/B07FD98N8J/ref=sr_1_2?gclid=Cj0KCQiAw8OeBhCeARIsAGxWtUwBLTCz0UFqaNAR19nPhGkZedCicuhI85gGYoDwjRzrCFuRCj0fOkYaAt70EALw_wcB&hvadid=384322822234&hvdev=c&hvlocphy=9022196&hvnetw=g&hvqmt=b&hvrnd=15085001523702390373&hvtargid=kwd-385077632050&hydadcr=8434_9618941&keywords=low%2Bspeed%2Bmotor%2Bdc&qid=1674701110&sr=8-2&th=1

Subsystem 3 (Physical Showerhead Subsystem)

For the physical subsystem we are planning on making a 3-d printed shell to make room for the sensor and positioning subsystems as well as space for the actual shower head. The 3-d printed showerhead will mimic most other showerheads in design but include space for sensors and motors to move the showerhead.

Subsystem 4 (Remote Control Subsystem)

The remote control subsystem will communicate with the sensor and positioning subsystem and will have a raspberry pi to store user data and display it to the display subsystem. The remote control subsystem will also have a control to move the position of the shower head. A joystick will be attached to the remote control subsystem that will be able to communicate with the

positioning subsystem and move the physical showerhead to the desired location. The display and remote control subsystems will be disconnected from the actual showerhead and communicate with the showerhead using another communication device.

Raspberry PI : SC0510

<https://www.microcenter.com/product/643085/pizero2w?src=raspberrypi>

Communication Device: 1597-101990981-ND

https://www.digikey.com/en/products/detail/seeed-technology-co.,-ltd/101990981/16570945?utm_adgroup=Seeed%20Technology%20Co.%2C%20LTD.&utm_source=google&utm_medium=cpc&utm_campaign=Shopping_DK%2BSupplier_Tier%201%20-%20Block%202&utm_term=&utm_content=Seeed%20Technology%20Co.%2C%20LTD.&gclid=Cj0KCQiAw8OeBhCeARIsAGxWtUwG39PuVvJmQc2wMEMMwPOC3TXsFfnmmdyhkOCejJKQ6LNssnmC9gYaAvDWEALw_wcB

Joystick: 108-THB001P-ND

https://www.digikey.com/en/products/detail/c&k/THB001P/11687191?utm_adgroup=Navigation%20Switches%2C%20Joystick&utm_source=google&utm_medium=cpc&utm_campaign=Shopping_Product_Switches&utm_term=&utm_content=Navigation%20Switches%2C%20Joystick&gclid=Cj0KCQiAw8OeBhCeARIsAGxWtUzvjqUbl3elGeC2eboiJbUuwHlz2HG6AQwAD6CnUdDfo5_368jM08AaAi_yEALw_wcB

Subsystem 5 (Display Subsystem)

We will attach a display to the remote control subsystem so that information collected by the sensor subsystem such as duration of shower, water temperature, and position can be displayed to the user. The display can also be used to show what user is active and allow users to select their profile when beginning the shower. The display and remote control subsystems will be disconnected from the showerhead itself and able to be placed anywhere in the shower.

Display: NHD-2.4-240320CS-CTXI#-FT

https://www.digikey.com/en/products/detail/newhaven-display-intl/NHD-2.4-240320CF-CTXI%23-FT/5209661?utm_adgroup=Optoelectronics&utm_source=google&utm_medium=cpc&utm_campaign=Shopping_Supplier_Newhaven%20Display%20Intl_0757_Co-op&utm_term=&utm_content=Optoelectronics&gclid=CjwKCAiAoL6eBhA3EiwAXDom5jzZoB8yeT2P9AaCyGGPeD4VBZH H3EnTSgcZhfHkxkdWlvbkh_4DmhoCLcgQAvD_BwE

Criterion For Success

To be successful our shower head should be able to save multiple user's data and display the user's average shower time, user's preferred temperature, and current water temperature. Furthermore our showerhead should have accurate temperature readings making it easier for the user to set the dials to their desired temperature. The showerhead should also be able to record its position and recreate its position after any movement. With all these features, the main goal of our project is to enhance the user's shower experience.