

# Smart Bathroom

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## Introduction

As phone dependance increases, devices are brought into the bathroom during time meant for personal care. The SmartBathroom device mitigates this dependency while providing an intuitive and hygienic alternative!

Experience the perfect blend of innovation, style, and functionality with the incredible SmartBathroom device: browse the News and Weather with ease thanks to advanced gesture tracking technology, take control of your brushing habits with the bluetooth SmartToothbrush, and get real-time answers to all your important questions with the integrated AI Chatbot.

Join the smart home revolution, and make every day extraordinary!

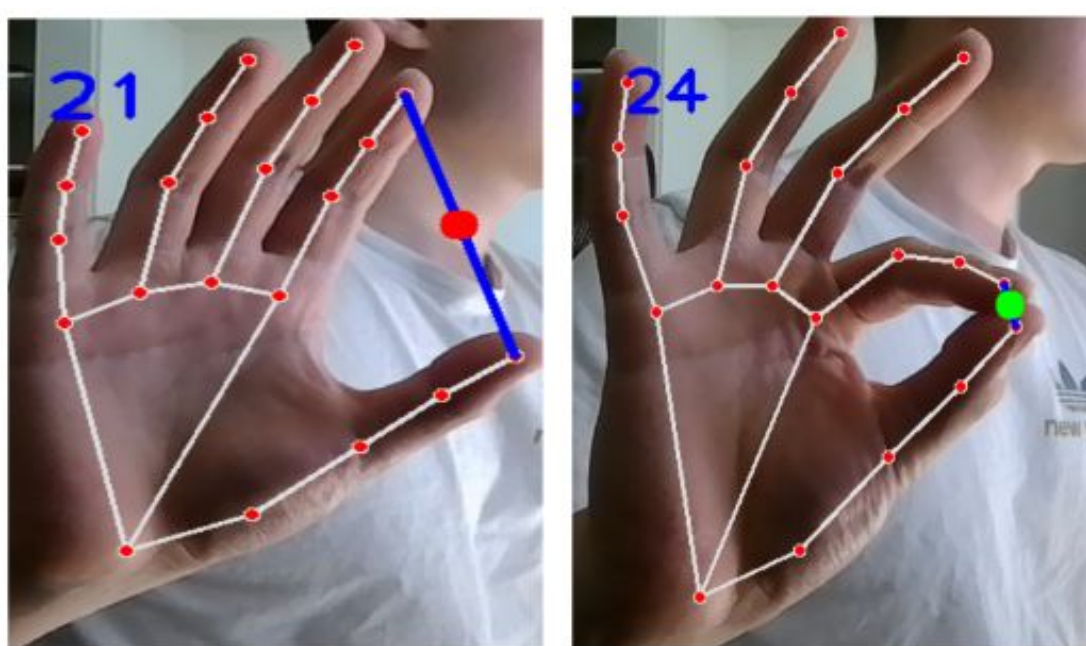


Fig. 1: Demonstration of the SmartBathroom's advanced Gesture Control system

## Features

- > Gesture Control System
- > Bluetooth SmartToothbrush
- > Personalized Brushing Telemetry
- > AI Chatbot Assistant
- > Customizable Mirror Interface

## Objectives

We aimed to develop and construct a low-cost, user-friendly SmartMirror with advanced gesture control and an AI chatbot, as well as a bluetooth-compatible SmartToothbrush.

Our SmartBathroom design ensures quality, accurate gesture control, and brushing metrics. Users can ask questions to an AI chatbot and track their toothbrush usage throughout the days and weeks.

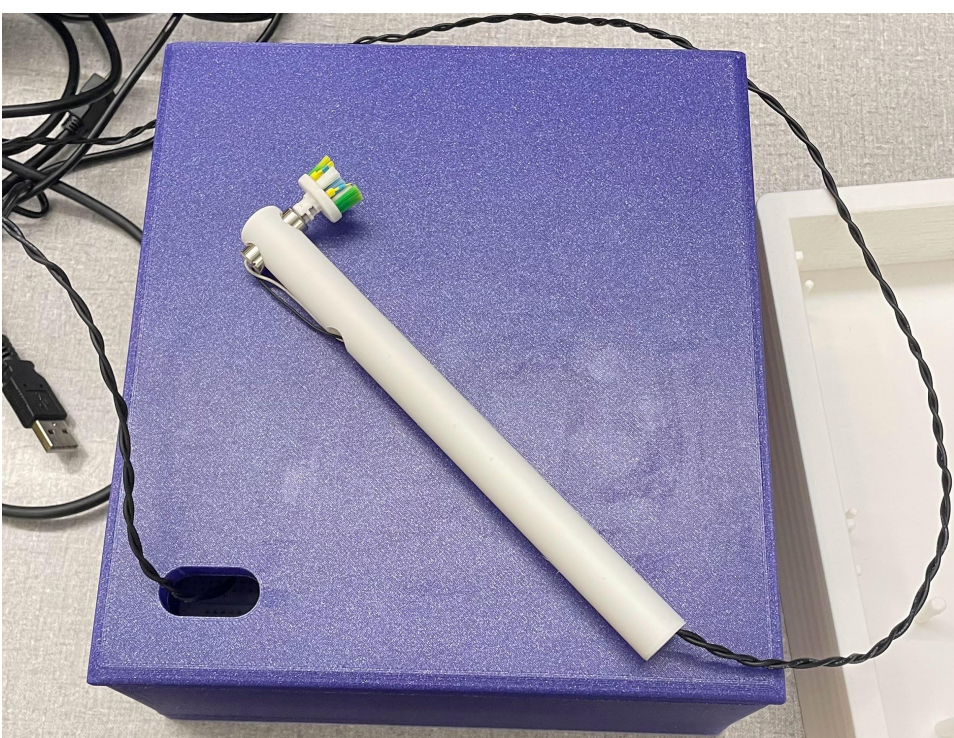


Fig. 2: The SmartToothbrush is contained within a convenient casing!

## Methods

**Bluetooth:** Wireless UART protocol with an HC-06 module; uses common Linux tools BluetoothCTL and RFCOMM to pair the toothbrush (powered by an STM32) to the mirror (a Raspberry Pi)

**Telemetry:** Custom in-house Python command-line tools with JSON databases to manage and display toothbrush telemetry data

**ComputerVision:** Leveraged advanced multithreaded Python to detect hand gestures for cursor movement

**Toothbrush Construction:** Custom 3D printing to develop toothbrush case and body; used freeCAD to design and optimize toothbrush construction

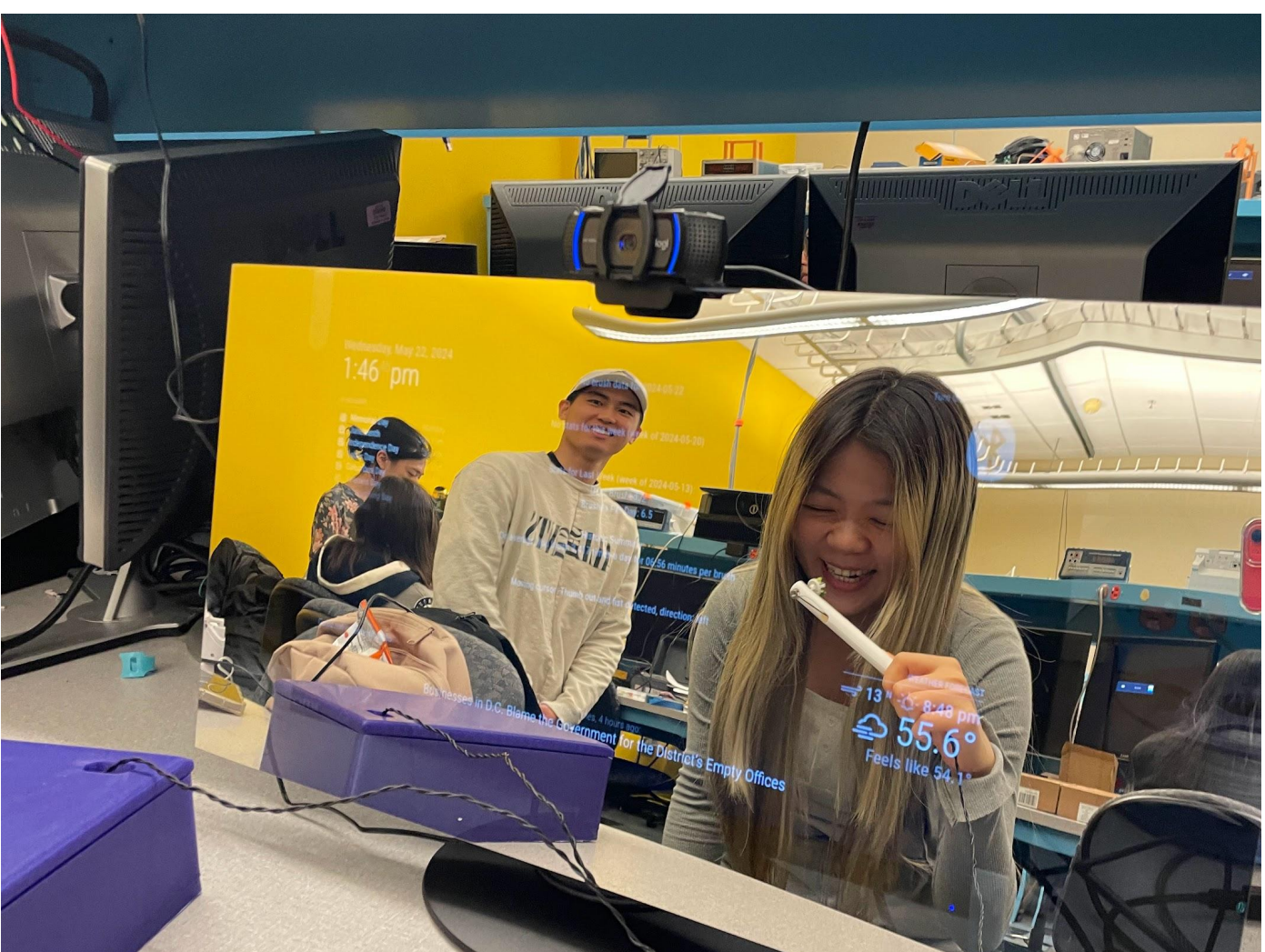


Fig. 3: Live demonstration of the SmartBathroom system

## Results

In our SmartBathroom project, we achieved significant advancements in integrating smart technology into daily bathroom routines. The SmartMirror successfully displayed relevant information (Weather, News, Brush Telemetry), and enhanced UX with intuitive gesture controls. This was complemented with the bluetooth SmartToothbrush, providing real-time feedback on brushing habits, and promoting oral hygiene with our advanced telemetry system.

Our analysis, centered around the practical benefits of the SmartBathroom features. Users can expect an enhanced morning routine, streamlined by accessible information and interactive features directly from our SmartMirror. The telemetry data from the SmartToothbrush allows users to track and improve their brushing habits with ease.

Figure 4 illustrates the interaction flow between the SmartMirror and the SmartToothbrush, highlighting the seamless data exchange. This exemplifies how our design bridges the gap between technology and daily wellness routines, offering a glimpse into the future of personal care.

## Conclusions

The SmartBathroom represents a significant advancement in home automation. With advanced Bluetooth, ComputerVision, and Microcontroller technology, we've created a multifunctional, touch-free, and hygienic solution that enhances daily routines. Our product improves everyday life by providing:

- > Intuitive navigation of News and Weather
- > Real-Time Brush Telemetry
- > Hygienic, Hands-Free Interface

### Accomplishments:

- > Wireless Bluetooth SmartToothbrush
- > Robust brushing telemetry system
  - > Written in Python
  - > Interfaces JSON for data management
  - > Docker for cross-platform testing
- > High-Speed Multithreaded Gesture Control
  - > Handles cursor movement and clicking

### Future Goals:

- > Advanced ComputerVision features
  - > Eye-Tracking
  - > Facial Recognition
  - > Hand Tracking
- > Custom Integrated PCB
  - > Reduce the SmartToothbrush form factor

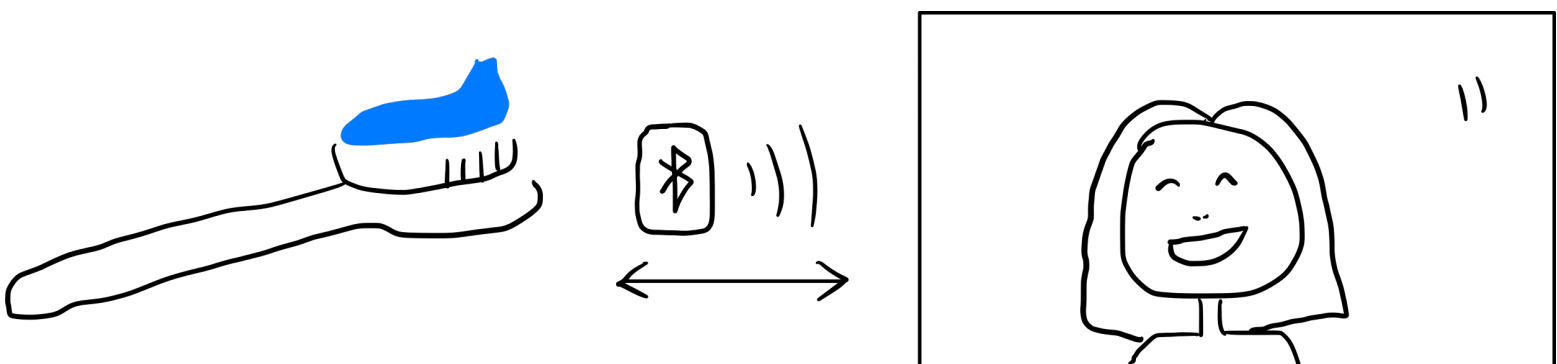


Fig. 4: SmartToothbrush-SmartMirror bluetooth interfacing