Smart Mirror

Group Member:  
  
  
  
  
  
  
  
**Summary:**

The smart mirror has the necessary applications and features needed for time efficiency focused device. First, there is the easy on and off. The mirror automatically recognizes that there is a user present and turns on the screen hidden behind the two-way mirror. A suit of six applications are presented on the 32” high-definition screen surrounded by a framed encasing that contains speakers and a webcam. These apps include weather, Twitter, news, to-do list, calendar, and music. The application can be interacted with by use of the Leap Motion controller. This controller allows for touch-free control of the smart mirror by use of finger swipes, taps, and circles. There is also the option to use voice control to play music, post a tweet, or add a task to the to-do list. Finally, the mirror monitors its own temperature and humidity levels so that if the bathroom becomes potentially harmful to the computer’s hardware, it can execute preventive measures and shut the system down.

To develop a design of this size, significant research had to be done. First, similar projects and products had to be investigated to what has been done and possibly what needs to be done. Next, the individual pieces of the mirror had to research in order to decide on the best product to use in the smart mirror system. Some of these topics included the gesture control, voice recognition system, MCU, and hard drive type. Once the comparisons were made, each component was analyzed on how it will function within the system and what it has to offer.

The design of the smart mirror was broken down into subsystems that represent important components of the project. Since there are hardware and software components to design, a block diagram was needed for both. The technical specifications were written for each subsystem for documentation and reference during the prototyping stage. The design contained charts, state-diagrams, and circuit designs regarding the details relating to what was prototyped. Once completed, the smart mirror delivered the experience of technology becoming part of a user’s routine and not an extra task.

**Project Description:**

**Motivation:**

Effective time management is one of the most important factors for success and productivity in a person’s day-to-day life. With the increasing integration of technology in our lives, maintaining an efficient schedule has become both easier and more difficult. Keeping up to date with appointments, Twitter, news, social media, and other things is made easier through technology such as tablets, PCs, and smartphones yet also provide distractions that can interrupt anyone’s routine. Technology has become another task in the day that time must be allotted for. In the finite time of the day, technology needs to be designed to work within our schedule and not be an extra piece to it.

The key to effective time management involving technology is multitasking. Anyone in the business or academic world would agree that every second counts in the day. This project was formulated through inspiration seen through movies such as Iron Man and tech demos, such as Samsung’s transparent LCD Smart Window, seen at the International Consumer Electronics Show in 2012. This extends as well to the continuing trend of integrating touchscreens and internet-connectivity into everyday appliances such as ovens and refrigerators. The idea of a smart home is the direction lots of companies are heading and while the kitchen has been getting lots of attention, the bathroom has not. Besides the kitchen, the bathroom is one of the busiest rooms in the home, so it is an excellent place to expand the smart home next.

Constant information and instant access to it drive the current generation. Forget bringing smartphones and tablets into the bathroom and risking damage. The smart mirror will show you that information with the swipe of a hand. The smart mirror is the result of our team brainstorming on how to solve all these issues and develop something that is functional as well as a showpiece.

**Goals and Objectives**

The smart mirror must offer benefits of using modern technology while integrating seamlessly into the standard bathroom routines of most people. The smart mirror must be simple and as intuitive as possible. The smart mirror would be used to merge technology and the need for information into anyone’s daily schedule. With the mirror in place, the user could interact and obtain the information they want during their normal morning and night bathroom routines.

This smart mirror aims to reduce and possibly eliminate the need for the user to make time in their daily morning or nightly routine to check their PC, tablet, or smartphone for the information they need. The mirror will provide the information with little to no effort from the user with the goal of not being a burden that he or she must maintain. The mirror wouldn’t be another activity, rather an enhancement to the already common use of mirrors in most modern bathrooms.

The mirror will do the thinking for the user. First, it will turn on and off by itself. Then, it will update with the user’s calendar schedule, to-do lists, Twitter, news, and weather. The information wouldn’t be thrown in the user’s face, but unobtrusively displayed on the edges of the mirror to still allow use of the actual mirror. The use of touch-less gestures will keep things simple and easy to use. No keyboards to try to keep dry and clean. The gestures will also allow the user to still use the mirror despite whether their hands are wet or dirty. The mirror provides common information most people check their smartphones or tablets for, such as weather, news, Twitter and schedules. This allows the users to read, think, and plan their day while getting ready in the morning or night. The mirror has to be fun as well. It will provide music playback that can be controlled by their voice so there is no need for a mouse or keyboard.

Finally, the mirror must be smart enough to protect itself from the wet and humid conditions that occur in every bathroom. It will feature a humidity protection system where it will monitor the temperature and humidity levels near the hardware. If the temperature or humidity levels are out of the safe operating range, then a failsafe system will notify the PC system so it can shut off to prevent damage.

**Requirements and Specifications**

The smart mirror requirements and specifications took inspiration from people’s everyday devices that they use including PCs, tablets, and smartphones. The mirror integrated similar features from each to give the user what they would expect out of a modern “smart” device. The following requirements and specifications were designed to satisfy the goals and objectives discussed in the previous documentation section.

PC Specifications

|  |  |
| --- | --- |
| **Input Voltage** | 6V to 18Vdc converted to 5V, 4A via step-down DC/DC converter to power the Raspberry Pi |
| **SATA** | Allows you to connect SATA devices to your Raspberry Pi |
| **Audio** | -3.5mm MIC in jack   - 3.5mm stereo audio jack  - SPDIF output  - Audio IO connector (Microphone input and stereo audio amplifier 3.3Wx2) |
| **Wireless** | - WiFi (IEEE 802.11b/g/n) with external antenna   - IR sensor (38KHz)  - Bluetooth serial communication |
| **USB Storage** | - Self-powered USB hub with 3 ports |
| **Real-time clock (RTC)** | -  Based on DS3231SN with included CR2032 battery |
| **Misc** | - Power output socket  - Camera flex slot so camera can still be used with the expansion  board attached  - DIP switch to remove connection from RPi’s pin header  - Directly connected on top of the Raspberry Pi using the board GPIO header pins   - No wiring nor soldering is required   - Duplicated the 40-pin header of the R-Pi in order to support existing expansion boards   - Suitable for Raspberry Pi Model B+ and Raspberry Pi 2 Model B |
| **Dimensions** | - 85 x 56mm (Same size as Raspberry Pi) |

**Necessary Features**

The “necessary” features were requirements that are imperative to the project’s design and objectives. They were designed and implemented before any additional features were worked on. The necessary features range from hardware requirements to interactive elements and to software elements. These necessary features are listed below.

* The smart mirror is designed to use a 32” diagonal display, positioned vertically, which will mounted behind a one-way mirror allowing only elements lit on the screen to be seen by the user.
* The smart mirror is interacted by the user through the use of an infrared/camera controller called “Leap Motion”. This controller allows for touch-free multi- gesture recognition within an 8 cubic feet area above the controller.
* The smart mirror has a temperature and humidity monitoring system that will relay data to the user as well as a failsafe system to keep the electronics protected from water damage. The ideal operating range is 60 to 90 degrees Fahrenheit and between 20 to 80 percent humidity.
* The smart mirror contains speakers that allow for application notification sounds and music playback.
* The smart mirror user interface has a set of 7 standard applications that provide important information to the user including weather, Twitter, news, to-do list, calendar schedule, music, and clock.
* The smart mirror has an auto-on and auto-off system via use of a webcam mounted in the housing. The mirror will turn on when it recognizes that there is a user standing in front of the mirror. The mirror will turn-off after 2-minutes of no user present.
* The smart mirror has voice control through a voice recognition system developed into the user interface. The voice control allows for interaction with the music, to- do list, and twitter applications. The voice control is activated through a gesture provided by the user.

Business Model:

B2C:

1. sell products
2. upgrade packages to enhanced functions

B2B

1. Integrate clothes designer to advertise the outfit on your mirror.
2. Integrate with cosmetic provider to advertise the product.
3. Skin Therapy expert to provide consolation

Implementation:

Schedule:

1. Prototype: 1 month for basic function
2. Apply funding for mass production.
3. Production & benefits