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Project: Interactive Mirror

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DOCUMENT REVISION HISTORY

Revision #	Date	Description	Rationale
1	04/05/2013	Initial Submission	Required

1 INTRODUCTION

1.1 DOCUMENT OVERVIEW

This document is the System Test Plan for Mirrors Inc. which includes the test plans for the Interactive Mirror System. The document will describe and detail how the system will be tested as well as listing the testing priorities. Requirements from the System Requirement Specification, Architecture Design Specification and Detailed Design Specification will be verified in this document.

1.2 PURPOSE

The purpose of this System Test Plan is to ensure correct functionality of the system during each stage of development. Verifying functionality at each stage ensures the project adherence to the specifications laid out in the System Requirement Specification, and the more detailed ones in the Architecture Design Specification and Detailed Design Specification.

1.3 DEFINITIONS AND ACRONYMS

IMS	Interactive Mirror System
GUI	Graphical User Interface
CPU	Central Processing Unit
SRS	System Requirement Specification
ADS	Architecture Design Document
DDS	Detailed Design Specification
Focus	Refers to when one of the apps are selected and opened up in the middle of the mirror.

TABLE 1- DEFINITIONS AND ACRONYMS

2 REFERENCES

2.1 OVERVIEW

The following are customer requirements from the SRS. These requirements will serve as a basis for the development of test cases that ensure the customer's needs are met. Further details about each case can be found in Section 3 Customer Requirements in the SRS documentation.

2.2 SYSTEM REQUIREMENT SPECIFICATION

2.2.1 CUSTOMER REQUIREMENTS

The following are customer requirements from the SRS. These requirements will serve as a basis for the development of test cases that ensure the customer's needs are met. Further details about each case can be found in Section 3 Customer Requirements in the SRS documentation.

3.1	The device has a simple to use interface
3.2	The device uses facial recognition for user login
3.3	The device uses gesture recognition for user navigation
3.4	The device recognizes select voice commands
3.5	The device logs in current users automatically
3.6	The device creates accounts for new users
3.7	The device records and displays health diagnostics
3.8	The device displays the information about the user's social media
3.9	The device displays the user's email
3.10	The device displays the user's calendar and to-do list
3.11	The device displays local news, traffic and maps
3.12	The device displays personalized news and stocks
3.13	The device is able to play music and media

2.2.2 PACKAGING REQUIREMENTS

The following are packaging requirements are from the SRS. These requirements will serve as a basis for the development of test cases that ensure the customer's needs are met. Further details about each case can be found in Section 4 Packaging Requirements in the SRS documentation.

4.1	The device stays stagnant within the box during shipping
4.2	The software is all preloaded and ready to use
4.3	The device is includes a user manual
4.4	The mounting hardware will contain mounting brackets, screws and wall anchors

2.2.3 PERFORMANCE REQUIREMENTS

The following are performance requirements are from the SRS. These requirements will serve as a basis for the development of test cases that ensure the customer's needs are met. Further details about each case can be found in Section 5 Performance Requirements in the SRS documentation.

5.1 The processor processes functions requested in a timely manner, but not cause overheating.
5.2 The camera automatically senses gesture movement and performs facial recognition
5.3 The microphone provides voice recognition for each user

2.2.4 SAFETY REQUIREMENTS

The following are safety requirements are from the SRS. These requirements will serve as a basis for the development of test cases that ensure the customer's needs are met. Further details about each case can be found in Section 6 Safety Requirements in the SRS documentation.

6.1 The device does not present an electrical hazards to the user
6.2 The device has an on/off switch in case of system malfunction
6.3 The device is enclosed in such a way that wiring is not exposed to its users
6.4 The device is properly mounted and secured
6.5 The device is only coupled to a 110 volt power source

2.2.5 MAINTENANCE AND SUPPORT REQUIREMENTS

The following are maintenance and support requirements are from the SRS. These requirements will serve as a basis for the development of test cases that ensure the customer's needs are met. Further details about each case can be found in Section 7 Maintenance and Support Requirements in the SRS documentation.

7.1 The hardware for this system uses common consumer based computer hardware components including hard drives, memory and power supply.
7.2 The critical hardware will have restricted access for safety and trade secrets.
7.3 The device will automatically provide software updates for the system
7.4 The device is able to manually update software
7.5 The device has the ability to restore to factory settings
7.6 The system is accessible from a keyboard and mouse for maintenance and diagnostic purposes

2.3 ARCHITECTURE DESIGN SPECIFICATION

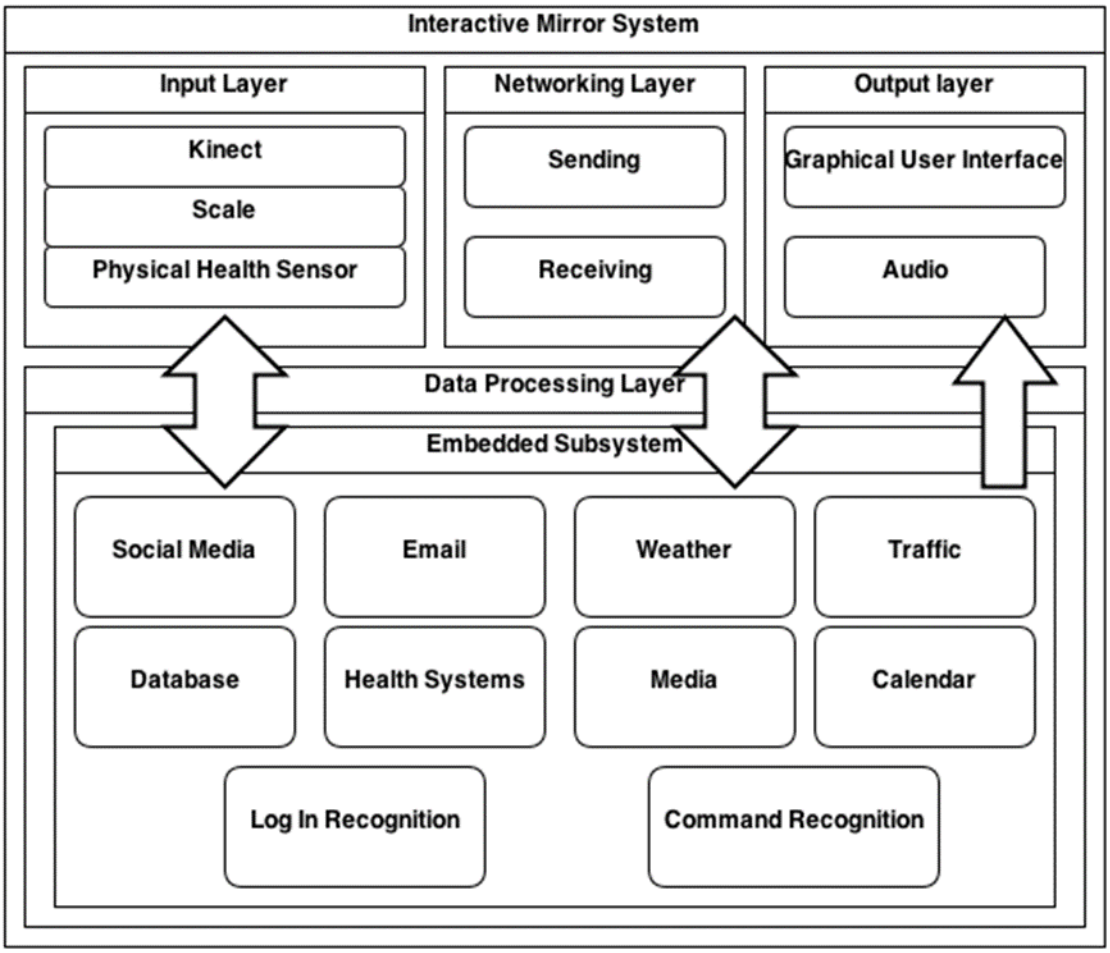

FIGURE 1 - LAYER OVERVIEW

2.3.1 LAYER OVERVIEW

- **Input Layer:** This layer is responsible for receiving inputs from the user or inputs from other IMS components. The Input layer will then pass this data to the next layer, which is data processing layer. This layer may receive data directly from the user, through the Kinect, or the scale.

  The purpose of the input layer is to obtain data and then transmit the data to the next layer, which is the data processing layer. The input layer receives data from the user or IMS components. It then transfers that data to the data processing layer.

  The input layer depends on the functionality of the IMS hardware components and user interaction. Kinect and other IMS components must work properly and transmit accurate data to the input layer.

- **Data Processing Layer:** This layer provides the function of: determining the user's interaction with the system, computing personal health statistics, request the user's information from the network and sending instructions for the output layer to execute.

The purpose of the Data Processing Layer is to analyze the data from the input sensors to determine how the user is interacting with the system as well as computing personal health statistics. For this layer, data is received from either the input layer or the network layer; from that, it determines instructions or data, and sends the processed data to either the output layer or the network layer.

The processing layer depends upon the embedded system to do all the computing. The function of the data processing will depend upon the type of input provided from either the input layer or the network layer.

- **Network Layer:** This layer transmits data externally with the user and internally with the data processing unit and application functions such as the health diagnostic, weather, email, calendar, etc. It will communicate between a sender and a receiver. The control of the different devices can be integrated and will be mainly based on equipment with the following connection standards: Bluetooth, IEEE 802.11g and IEEE 802.15. The different networks will be integrated using the TCP/IP protocol.

  The purpose of the Network Layer is to transport packet segments from the scale, and to connect to the internet to get personal information for weather, email, news…etc., to send to the data processing layer. It also transmits packet segments received from the data processing layer to the GUI. The network layer does not process any data; it is simply an intermediary protocol from the source to the destination.

  The network layer depends on the data processing layer to provide applications datagram packet segment to the mirror screen by GUI.

- **Output Layer:** The output layer will provide informational output to the user based upon information gathered from other layers. It will mostly contain objects related to the GUI. This will allow an easy way for the user to receive output from the system.

  The purpose of the output layer is to present output of the system to the user using a graphical user interface. The output layer will receive informational data from the data processing and input layers and display it graphically to the user.

  The output layer will depend on the information from the data processing and input layers. Processing by the output layer will be for displaying the graphical user interface for the user.

2.3.2 SUBSYSTEM OVERVIEW

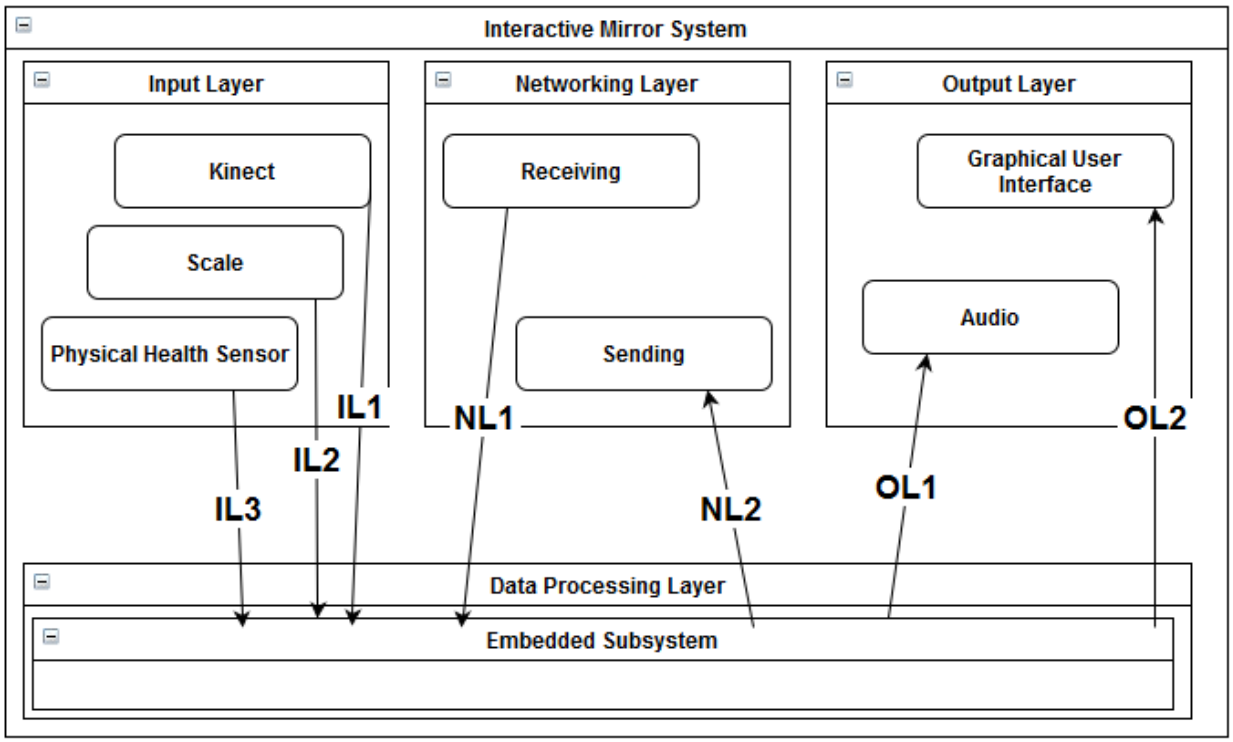

FIGURE 2 - DATA FLOW

2.3.3 INTER-SUBSYSTEM DATA FLOW

Data Element	Data Description
IL1	Image and Audio data sent from the Kinect to Embedded System
IL2	Health data sent from Scale to Embedded System
IL3	Health data sent from sensor(s) to Embedded System
NL1	Data received from the Network (internet/LAN) to Embedded System
NL2	Data sent from Embedded System to Network (internet/LAN)
OL1	Audio sent to the Speakers from the Embedded System
OL2	Formatted data sent to the GUI from the Embedded System

TABLE 2 - INTER-SUBSYSTEM DATA FLOW

2.3.4 REQUIREMENT MAPPING

Number	Requirement	Input Layer	Data Processing	Network	Output
3.1	Simple User Interface	X			X
3.2	Facial Recognition	X	X		X
3.3	Gesture Recognition	X	X		X
3.4	Voice Recognition	X	X		X
3.5	User Recognition	X	X		X
3.6	New User Registration	X	X		X
3.7	Health Diagnostics	X	X		X
3.8	Social Media	X	X	X	X
3.9	Email	X	X	X	X
3.10	Calendar	X	X	X	X
3.11	Weather, Traffic, and Maps	X	X	X	X
3.12	News and Stocks	X	X	X	X
3.13	Music and Media	X	X		X

TABLE 3 - REQUIREMENT MAPPING

2.3.5 REQUIREMENTS TRACEABILITY MATRIX

Requirements	Simple User Interface	Facial Recognition	Gesture Recognition	Voice Recognition	User Recognition	New User Registration	Health Diagnostics	Social Media	Email	Calendar	Weather, Traffics, Maps	News and Socks	Music and Media
Input	●	●	●	●	●	●	●	●	●	●	●	●	●
Data Processing		●	●	●	●	●	●	●	●	●	●	●	●
Network								●	●	●	●	●	
Output	●	●	●	●	●	●	●	●	●	●	●	●	●

TABLE 4 - REQUIREMENT TRACEABILITY MATRIX TABLE 5 - HARDWARE TESTS

3 TEST ITEMS

3.1 OVERVIEW

This section outlines tests to be performed during the implementation phase of the project. This will guarantee that all sections of this project will work according to the SRS document using the test plan in the DDS. These tests will be divided into sections based on the layer systems and subsystems. The first section of tests will be on the physical hardware of the system. This includes the Embedded System, Kinect, Scale, Health Sensor, and Display Monitor. The next section of tests will be based on the Software. This includes processing the data from the physical sensors along with email, Facebook, Twitter, news, weather and the rest. Finally we will test the integration of the full system to make sure everything works correctly together.

3.2 RELATIONAL DIAGRAM

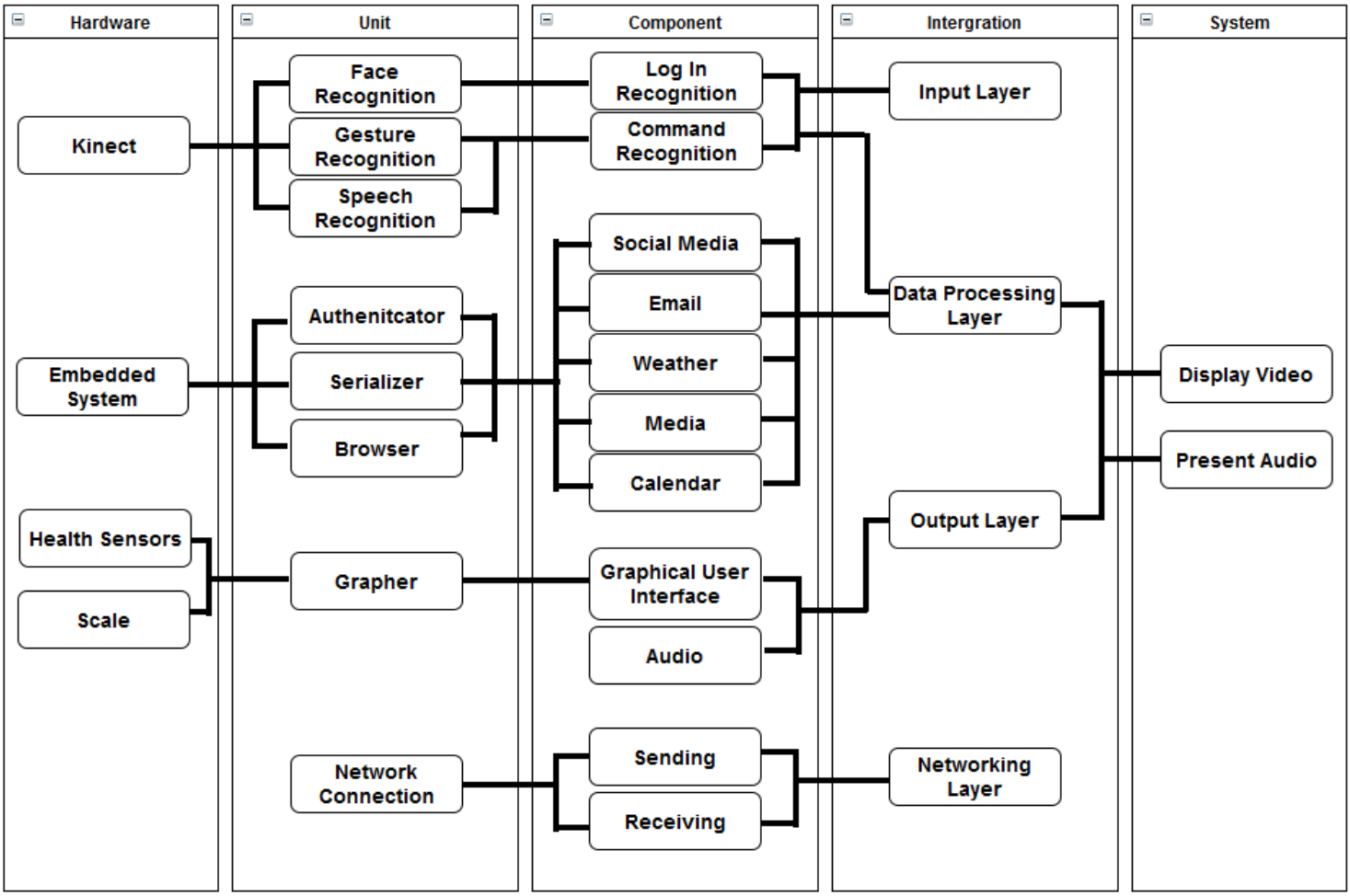

FIGURE 3 - RELATIONAL DIAGRAM

3.3 HARDWARE TESTS

Test ID	Hardware	Input	Expected Output	Risk
H1	Kinect	Power Source	Powered	Low
H2	Kinect	USB Connection	Installed Drivers	Mid
H3	Kinect	Visual	Visual Data	Mid
H4	Kinect	Visual	Depth Data	Mid
H5	Kinect	Audio	Audio Data	Mid
H6	Embedded System	Power Source	Powered	Mid
H7	Embedded System	Keyboard	Keyed Input	Low
H8	Embedded System	Mouse	Mouse Movement	Low
H9	Scale	Power Source	Powered	Low
H10	Scale	Physical Weight	Weight Measured	Low
H11	Health Sensors	Power Source	Powered	Mid
H12	Health Sensors	Physical Activity	Activity Data	Mid

3.4 UNIT TESTS

3.4.1 INPUT LAYER

Test ID	Module	Input	Expected Output	Risk
UI1	Face Recognition	Depth Data	Skeleton Data	High
UI2	Face Recognition	Video Data	Image Data	High
UI3		Image Data	Face Values	High
UI4	Gesture Recognition	Depth Data	Skeleton Data	High
UI5		Skeleton Data	Hand Positions	High
UI6		Hand Position	Gestures	High
U17		Gestures	Recognized Gestures	High
U18	Speech Recognition	Audio Data	Speech	High
UI9		Speech	Speech Dictation	High

TABLE 6 - UNIT TESTS

3.4.2 DATA PROCESSING LAYER

Test ID	Module	Input	Expected Output	Risk
UP1	Authenticator	Facebook: Authentication URL + Key + Secret	IF New User: Facebook App Approval Login Screen ELSE: User Authentication Code	Mid
UP2	Authenticator: Facebook App Approval Login Screen	User Logs in and Authorizes Application	User Authentication Code	Mid
UP3	Authenticator	Twitter: Authentication URL + Key + Secret	IF New User: Twitter App Approval Login Screen ELSE: Twitter Authentication Code Screen	Mid
UP4	Authenticator: Twitter App Approval Login Screen	User Log ins and Authorizes Application	Twitter Authentication Code Screen	Mid
UP5	Authenticator: Twitter Authentication Code Screen	User Enters Twitter Code Into Key Text Box	Twitter Authentication Code	Mid
UP6	Authenticator: Twitter Authentication Code Screen	FitBit: Authentication URL + Key + Secret	IF New User: FitBit App Approval Login Screen ELSE: FitBit Authentication Code Screen	Mid
UP7	Authenticator: FitBit Authentication Code Screen	User logs in and Authorizes Application	FitBit Authentication Code Screen	Mid
UP8	Authenticator: FitBit Authentication Code Screen System	User enters FitBit code into Key text box	FitBit Authentication Code	Mid
UP9	Serializer	Data URL (Facebook/Twitter /Weather/Media /Calendar) +	JSON or XML based data	High

		Appropriate Authentication Code		
UP10		JSON data	Tokenized and placed in its appropriate class	Mid
UP11		XML data	Tokenized and placed in its appropriate class	Mid
UP12	Grapher	Health Data	Graphed Data	Mid

3.5 COMPONENT TESTING

3.5.1 INPUT LAYER

Test ID	Module	Input	Expected Output	Risk
CI1	Login Recognition	Face Values	User Identification	High
CI2		User Identification	Connect User to Skeleton Data, Login User	Mid
CI3	Command Recognition	Hand Position	Pointer Control	Mid
CI4	Command Recognition	Recognized Gestures	Correct Response	Mid

TABLE 7 - COMPONENT TESTING

3.5.1 DATA PROCESSING LAYER

Test ID	Module	Input	Expected Output	Risk
CP1	Social Media	Facebook JSON Data	Parsed Facebook Data: Username, First Name, Last Name, Home feed, Etc.	High
CP2	Social Media	Twitter JSON Data	Parsed Twitter Data: Username, Twitter count, Twitter home feed, Etc.	High
CP3	Email	Email account info (IMAP/POP3/Etc.)	Email inbox	High
CP4	Weather	Location	JSON data	Mid
CP5		JSON Data	Parsed Weather Data	Mid
CP6	Media	Local Music	Music Plays	Mid
CP7	Media	Local Images	Image Slideshow	Mid
CP8	Calendar	Calendar info (Google)	Calendar XML data	Mid
CP9		XML data	Parsed Calendar data	Mid

3.6 INTEGRATION TESTING

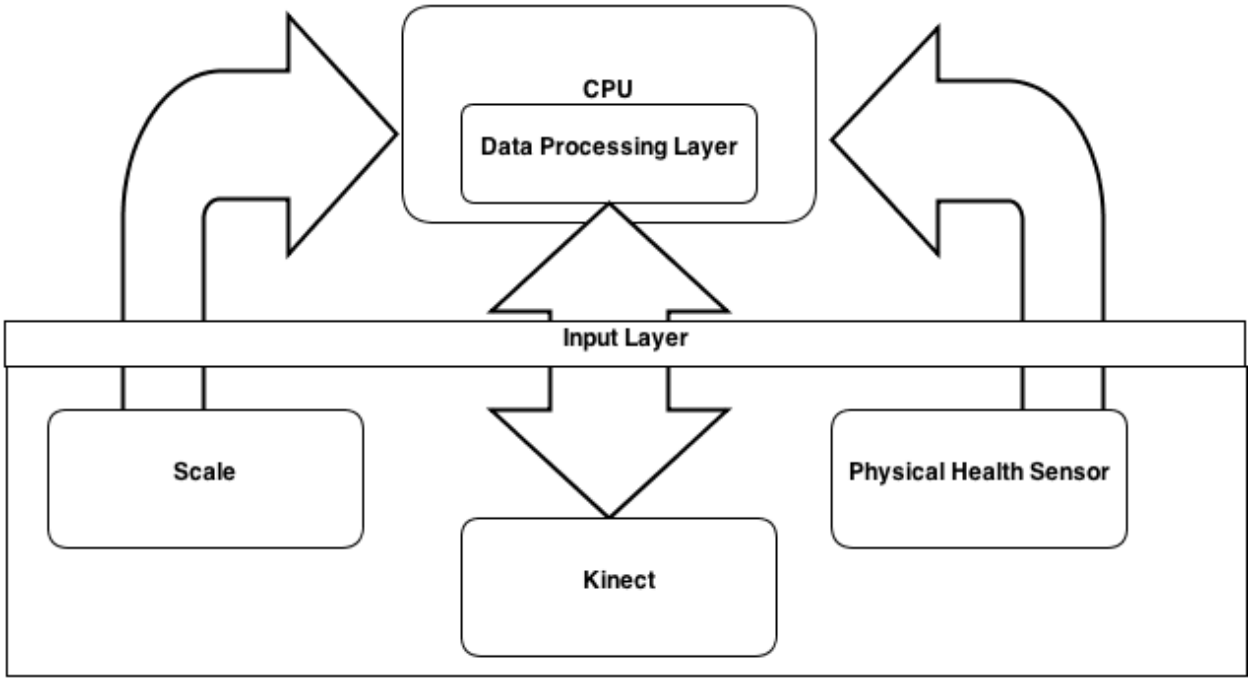

FIGURE 4- INPUT LAYER

3.6.1 INPUT LAYER

Test ID	Layer	Input	Expected Output	Risk
II1	Input	Person Appears	IF Not Recognized and new users are allowed: New User Setup Screen IF Not Recognized and new users are NOT allowed: No display shown IF Recognized: Login User	High
II2	Input	Hand detected	Track hand movements for gestures and positioning	High
II3	Input	Audio detected	Check for recognized speech	High

TABLE 8 - INTEGRATION TESTING

3.6.2 DATA PROCESSING LAYER

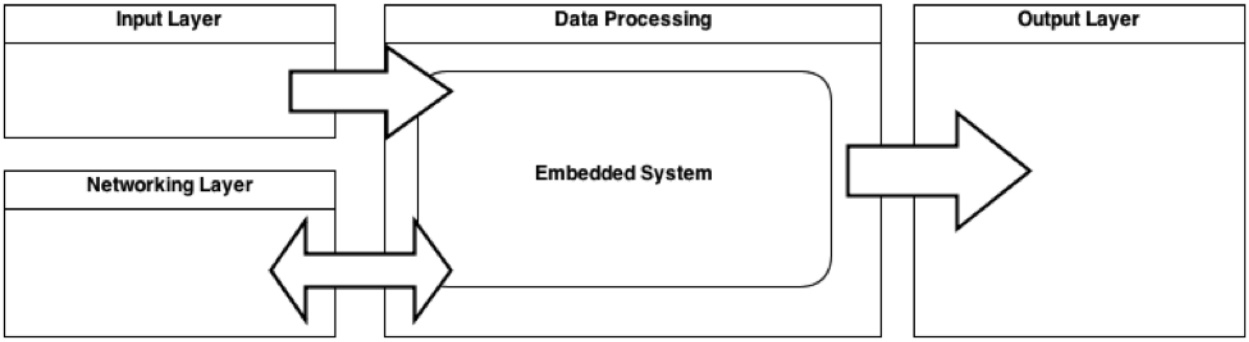

FIGURE 5 - DATA PROCESSING LAYER

Test ID	Layer	Input	Expected Output	Risk
IP1	Data Processing	Raw data	Raw and processed data	High

3.6.3 OUTPUT LAYER

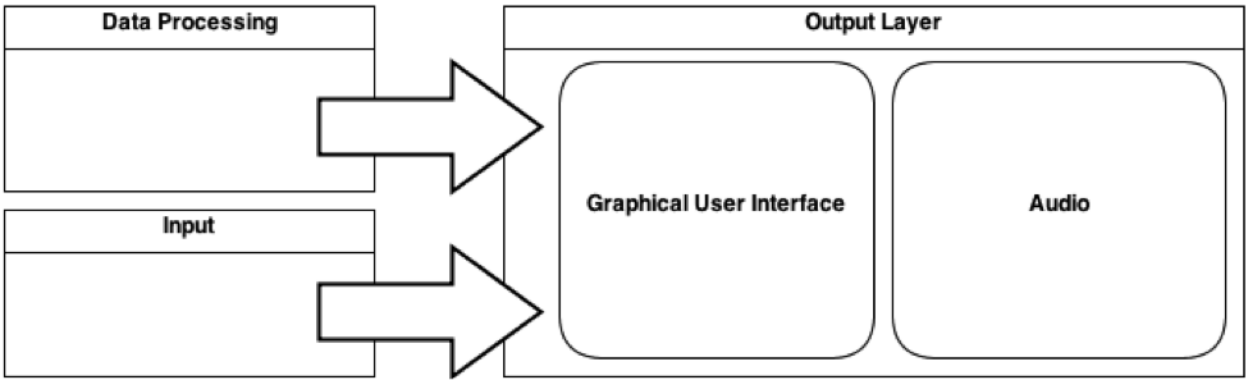

FIGURE 6 - OUTPUT LAYER

Test ID	Layer	Input	Expected Output	Risk
IO1	Output	Processed Data	Display in GUI	High
IO2	Output	Audio Data	Play from speakers	High

3.6.4 NETWORKING LAYER

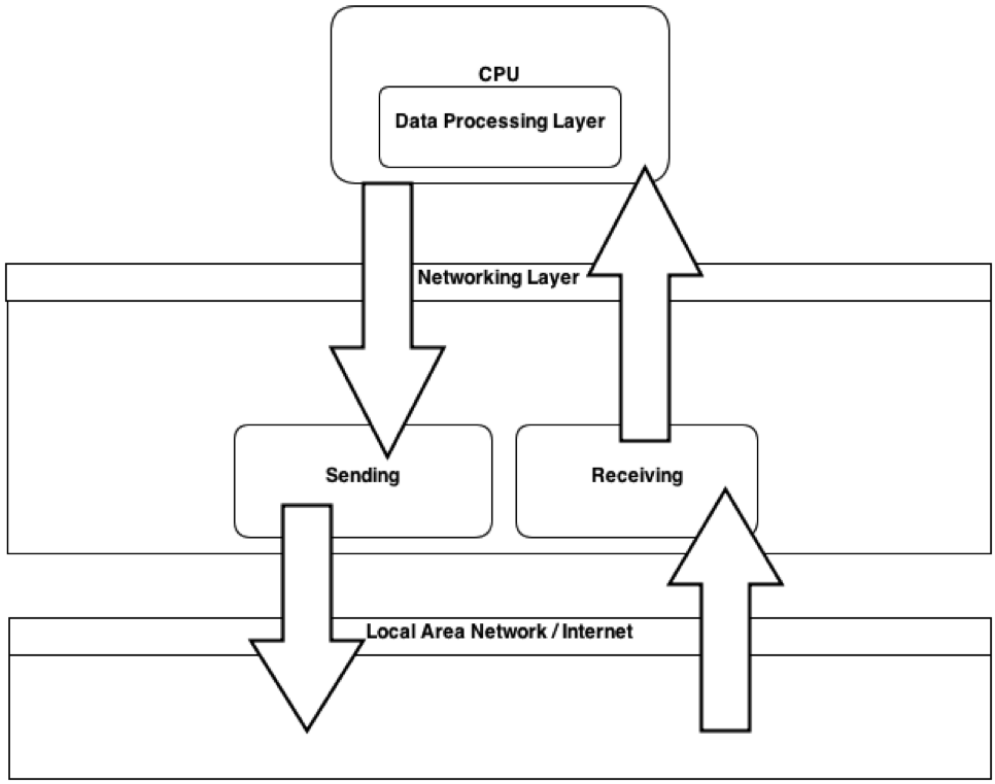

FIGURE 7 - NETWORKING LAYER

Test ID	Layer	Input	Expected Output	Risk
II1	Networking	Data to send	Send data on the network	High
II2	Networking	Received data from network	Send to Data Processing	High

3.7 SYSTEM VALIDATION TESTS

Test ID	Input	Expected Output	Risk
SV1	Power On	All modules operational	High
SV2	Power Off	All modules safely shut down	Mid
SV3	User Detected	User recognized	High
SV4		All modules load appropriate data	High
SV5	Non User Detected	No registered user data displays	High
SV6	Hand Detected	Hand tracked for input	High
SV7	Gesture Detected	Correct response	High

TABLE 9 - SYSTEM VALIDATION TESTS

4 RISKS

4.1 OVERVIEW

This section will identify the risks associated with the testing of the Interactive Mirror System.

4.2 RISK TABLE

Risk	Probability (Low/Medium/High)	Impact	Solution
Risk 1: Face recognition			
The system incorrectly recognizes the user	Medium	If the system doesn't recognize a registered user, the user may not be able to use all the system functionality. If the system doesn't recognize the registered user, the user will not be able to login automatically.	1 1
Risk 2: Health Scale/Sensor			
Finding a scale that wirelessly sends data to the system The Health Sensor gives	High	If we cannot find a scale that wirelessly sends health data (Height, Weight, BMI, Heart Rate, Blood Pressure, etc.) to the system, those data may not be available to the user via the system. If the health sensor gives out incorrect reading, the health readings could trouble	2, 3

incorrect reading	Low	the user. If the health sensor gives out incorrect reading, health related information would be turned off for the user.	7 7
Risk 3: Scale integration difficulty			
Figuring out the communication between the scale and the system.	High	If our team cannot figure out the communication between the scale and the system, those readings from the scale may not be available to the user.	2,8
Risk 4: Gesture / Voice Malfunction			
The system does not recognize voice commands The system does not recognize gesture commands The system incorrectly executes voice or gesture commands	Low	The user will not be able to interact with the system using voice The user will not be able to interact with the system using gesture The system executes a function that user didn't request	4 6 7,9
Risk 5: Kinect Failure			

The Kinect malfunctions and doesn't move as intended Kinect sensors doesn't work through the enclosure	Low Medium	If the Kinect doesn't move as intended, the system will not recognize the user, and the user won't be able to interact with the system using gestures. If Kinect sensors don't work through the enclosure, face recognition and gestures won't work.	6 7,10
Risk 6: Not completing tasks according to schedule			
Due to unforeseen circumstances, our team may not be able to complete all the functionalities that's described in SRS	Medium	If our team is not able to complete all the promised functionalities, our customers will not be happy, and our product will not be as pleasing to our customers as we have promised.	11,8
Risk 7: Voice Feedback			
The user cannot interact with the system using voice because of other voice feedback such as running shower/water, or music playing in the background	Medium	If there's a voice feedback, the system won't recognize the voice commands, and system will be unable to respond to the user request.	12
Risk 8: Knowledge in C#			
Lack of programming experience in C#	Medium	Due to the lack of knowledge in C# programming, we may not complete all promised functionalities or we may not be able to	8,13,14

		follow our schedule.	
Risk 9: Electric Failure			
The system or some components fail due to electric failure	Medium	If there's an electric failure, the mirror only works as a 'regular mirror' and not as 'interactive mirror', as described in the systems requirements specification document. Due to electric failure, the system will potentially have a safety hazard also. If the power is not distributed according to each components requirement, those components could be buggy and may not work as intended.	7,8
Risk 10: No internet Access			
The system will not function properly if there's no active internet connection	Low	If there's no internet connection, the system will not display information such as weather, news, traffic, emails, and calendar. The system also will not have the ability to store/retrieve users' health data from the stored database.	15,16

TABLE 10 - RISK TABLE

4.3 SUGGESTED PREVENTIVE AND CONTINGENCY MEASURES

1	Implement a keypad system as a secondary way of logging-in
2	The user will have the ability to manually enter their health data
3	Find a wireless cuff to take blood pressure that sends data wirelessly to the system

4	The user will be able to interact with the system using gesture
5	The system prompts the user to repeat the command
6	The user will be able to interact with the system using voice
7	The team will thoroughly test the system before production
8	The team will seek assistance from other expertise
9	The user will have the option to ‘Go Back’ or ‘Exit’ the system
10	The Kinect will be placed in such a way that no object is blocking it’s sensors
11	Follow schedule and project plan as much as possible
12	When a user is logged in, teach voice sensor to listen only to that user
13	Start learning C# early as possible
14	Work as a group and help each other
15	If no active internet connection is found, the application recognizes that and displays the information ‘Internet Unavailable’.
16	Prompt the user to connect to the internet

TABLE 11 - SUGGESTIVE MEASURES

5 FEATURES TO BE TESTED

5.1 OVERVIEW

The features in this section list the features that will be testing in order to assure that the Interactive Mirror System fulfills the requirements specified in the SRS. For a more detailed requirements list please review the SRS documentation.

5.2 CUSTOMER REQUIREMENTS

Simple User Interface

Description: The User Interface will interact with the user and provide broad array of information pertinent to the user. The interface will be simple and concise.

Priority: High

Facial Recognition

Description: Using the incorporated camera, the user(s) will be recognized based on their individual characteristics. Based on the facial recognition results, data will outputted to the user.

Priority: High

Gesture Recognition

Description: Using the incorporated camera, the user will be able to perform gestures and the system will react/interact based on those gestures.

Priority: High

Speech Recognition

Description: Using an incorporated microphone, the system will use speech recognition as a way of input.

Priority: Medium

User Recognition

Description: First time users will be required to allow the system to recognize their facial characteristics (facial recognition). Once these functions have been performed, the user will be given the option to create a username and password. If the user chooses not to do so, the user will be required to perform the same steps the next time he/she uses the IMS. Current users will be automatically recognized by the mirror and be able to log in.

Priority: High

New User Registration

Description: First time users will be required to allow the system to recognize their facial characteristics (facial recognition). Once these two functions have been performed, the user will be given the option to create a username and password. If the user chooses not to do so, the user will be required to perform the same steps the next time he/she uses the IMS.

Priority: High

Health Diagnostics

Description: Will provide up to but not limited to height, weight, body mass index, heart rate, blood pressure, fat and lean mass, diet, exercise, sleep patterns. If the user wishes to lose some extra weight, the system will recommend and track exercise and diet routines. It will also have some built in exercise that can be done and tracked in front of the mirror.

Priority: High

Social Media

Description: The user will be able to log into social media sites such as Twitter, Facebook, Windows Live, etc.

Priority: High

Email

Description: Will display the user's email on the screen if the user chooses to do so.

Priority: High

Calendar

Description: Will display the user's personal calendar if they choose to do so

Priority: High

Weather, Traffic, and Maps

Description: Will display the user's choice location's weather, traffic, and maps if they choose to do so.

Priority: Medium

News and Stocks

Description: Will display the user's choices of news and stocks if he/she chooses to do so.

Priority: Medium

Music and Media

Description: Will play music from the internal speaker system if the user's choosing

Priority: Medium

5.3 PERFORMANCE REQUIREMENTS

Processor Speed

Description: The processor should process the functions requested in a timely manner, but not cause overheating within the IMS.

Priority: High

Camera

Description: The camera will be able to autosense gesture movements and be able to perform facial recognition.

Priority: High

Microphone

Description: Microphone will be used to provide voice recognition to the IMS for each user

Priority: High

6 NON TESTABLE FEATURES

6.1 OVERVIEW

This section describes requirements that cannot be tested due to reasons such as not being testable.

6.2 PACKAGING REQUIREMENTS

Stagnate within Box

Description: The IMS should be properly packaged so that it does not move within the box.

Preloaded Software

Description: Software is preloaded and ready for customer use.

Mounting Hardware

Description: The mounting hardware will contain mounting brackets, screws, and wall anchors

Mounting Hardware

Description: The IMS should be properly packaged so that it does not move within the box.

6.3 SAFETY REQUIREMENTS

Restricted Hardware Sections

Description: Critical hardware will have restricted access for safety and trade secrets

Automatic Software Updates

Description: The IMS will have the option of automatic software updater

Manual Software Updates

Description: The IMS will have the option of a manual software updater.

Stagnate within Box

Description: The IMS should be properly packaged so that it does not move within the box.

Restore to Factory Settings

Description: The IMS will have the ability to restore to factory settings.

6.4 ERROR HANDLING REQUIREMENTS

Catastrophic Hardware Failure

Description: IMS is designed using replicable off the self-components allowing for easy replacement of parts in case of hardware failure

Catastrophic Software Failure

Description: IMS is designed to be able to revert back to factory settings in case of a catastrophic software failure

Stagnate within Box

Description: The IMS should be properly packaged so that it does not move within the box.

7 OVERALL TEST STRATEGY

7.1 OVERVIEW

This overview shall detail the Team 5's approach to testing the Interactive Mirror System. Team 5 will tests the Interactive Mirror System to ensure it meets the in the system requirements specification, architectural design specification and detailed design specification.

7.1 METHODOLOGY

Testing will follow the Relational Diagram by starting at the Hardware testing to guarantee that there are no hardware or driver issues. The next stage of testing, Unit testing, will concentrate primarily on the Input and Data Processing layers. This will be followed by Component testing to test for the correct output of the processed data. Integration testing, the next stage, tests the integration of the four major sub system layers. Finally with overall System validation testing to make sure everything is working correctly. Test cases will be created and divided by all persons in the team.

7.2 TESTING METRICS

The metrics used will determine the priority of each test case and will be based upon the priorities of the SRS and DDS documentation. Testing will follow as follows:

- **Acceptance Criteria:** In order for this project to be considered as complete, IMS must meet few requirements to meet the acceptance criteria. IMS will be marked as complete once the following requirements are met.
- **Critical Priority:** Failure of these components would critically effect the operation and functions of the IMS.
- **High Priority:** Failure of these components would have a major adverse effect to the most important functions of the system
- **Medium Priority:** Failure of these components would have a medium adverse effect to the important functions of the system.
- **Low Priority:** Failure of these components would have a minor adverse effect to the important functions of the system.

7.3 TESTING REQUIREMENTS

Testing requirements show that each test case must be measurably tested. Each test case will be broken up into sections that can be easily repeatable and reproducible.

8 ACCEPTANCE CRITERIA

8.1 OVERVIEW

This section describes the acceptance criteria for this product by defining passing or failing standards for each of the tests. The Acceptance Criteria has the following phrases of testing: hardware, unit, component, integration, and system verification.

8.2 HARDWARE TESTS

Although software is the backbone of our project, hardware failures can also occur with our device. Power and cooling is the most important testing that needs to be performed.

- Temperature must be regulated and continuously monitored over an extended period of time
- Ensure all units power and start up properly
- Ensure noise levels are acceptable
- Repeated test of Bluetooth and WiFi sync from the wireless USB adaptor
- TV must be able to display a clear 1080P screen provided via HDMI

8.3 SOFTWARE UNIT TESTS

The vast majority of the Interactive Mirror System relies on software ranging from modified RSS feeds to implementing the Kinect SDK. The IMS also incorporates the Windows 7 Embedded OS. Several tests will have to be performed to ensure all necessary components have been installed within the OS.

- All feeds must be tested to allow for several users and easy switching between users.
    - News
    - Facebook
    - Twitter
    - Gmail
    - Weather
    - Etc
- Kinect will accept hand gestures, speech recognition, and facial recognition. Numerous tests will be performed to guarantee new users are recognized and are provided an opportunity to register while existing users can easily access all features associated with his/her registration.
- The OS must be tested to ensure it does not crash and successfully supports the IMS program.
- The IMS program should implement power saving features and also present a quick response to shutting down and starting.

8.4 INTEGRATION TESTS

The IMS Mirror will be primarily be integrated by incorporating the Kinect, Fitbit Scale, the IMS program, and obviously the operating system installed. Successful test results will be :

- The unit and all components turn on when requested
- The unit and all components turn off when requested
- The unit and all components do not produce an excessive amount of heat.

8.5 SYSTEM VERIFICATION TESTS

Verification tests must be performed by repeatedly performing identical tests and receiving expected results each time. The tests include:

- The IMS outputs results as dictated by the ADS
- The IMS meets the requirements as laid out in the ADS
- The IMS performance meets or surpasses expectations of the user
- The IMS meets safety requirements (not yet defined)

9 TEST DELIVERABLES

9.1 OVERVIEW

This section provides a breakdown of items to be expected upon completion of the final Test Plan.

9.2 DELIVERABLES

9.2.1 SYSTEM TEST PLAN

The System Test Plan will be provided to anyone who wishes to read the document. It will provide the backbone of all subsequent testing that may be performed after the IMS is in production. This document will also encase pertinent information about the SRS, ADS, and Detailed Design documents.

9.2.2 TEST CASE SPECIFICATION

Test cases shall include the following.

- Hardware Tests
- Software Unit Tests
- Integration Tests
- Validation Tests

Each test will include valid inputs and outputs as well as invalid inputs. Exception tested will be performed in each case as well.

9.2.3 TEST RESULTS

Test Results will be documented using the following fields:

- Test Type (Hardware, Software, etc)
- Test #
- Tester Name
- Date/Time
- Description
- Input(s)
- Attempt Number
- Expected Output(s)
- Actual Output(s)
- Result (pass, fail, etc.)
- Notes

9.2.4 FAIL TEST RESULTS

Results of failed tests will be recorded in the following manner and provided here.

- Test #
- Test Type
- Test Description
- Test Date and time
- Tester's Name
- Description of Failure
- Severity(low, medium, high)
- Status(Fixed/Ignored)
- Risk if not resolved

9.2.5 TEST CODE

No test code has been completed to date. Upon completion, the test code will be provided here.

10 TEST SCHEDULE

10.1.1 OVERVIEW

In accordance with our timeline, this section will provide a general overview of the IMS testing schedule.

10.1.2 TEST SCHEDULE

Task Number	Task Name	Planned Start	Planned Finish
3.3	Hardware Testing	4/19/2013	4/21/2013
3.4	Unit Testing	4/19/2013	4/21/2013
3.5	Component Testing	4/21/2013	4/28/2013
3.6	Layer Testing	4/22/2013	4/28/2013
3.7	Integration Testing	4/29/2013	5/6/2013
3.8	System Verification	5/3/2013	5/6/2013

TABLE 12 TEST SCHEDULE

11 APPROVALS

Upon completion of the test plan, approval from each team member is required. The signatures of each member will be given below. To date, the testing document has not been reviewed by each member as each member is responsible for an assigned section.

Name	Position	Signature	Date
Vassilis Athitsos	Project Supervisor		
Dr. Bahram Khalili	Project Sponsor		
Mark Hutchinson	Team IMS (Lead)		
Robert Klenka	Team IMS		
Libin Mathew	Team IMS		
Peter Opoku	Team IMS		
Jessica Reece	Team IMS		