



Memo

To: Professor Pisano, Professor Osama AlShaykh
From: Allison Durkan, EJ Fitzpatrick, Johan Ospina Buitrago, Santiago Beltran, Tess Gauthier
Team: 13
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Subject: Ventana Final Deliverable Test Report

0.0 Set-Up through Web Portal

0.1 Description and Goal

The objective of this test is for the user to install her devices for the first time. This involved connecting to a web portal, hosted by the HoloHub, that can be conveniently accessed on any smartphone. The page displayed all the devices currently connected to the HoloHub, and displayed the corresponding VuMark. Upon launching Ventana, the HoloHub also sent a VentanaConfig.json file to the HoloLens, that allowed the HoloLens to recognize each of these supported devices. This initial discovery process allowed the user to interact with all the devices in their home supported by Ventana.

0.2 Procedure & Results

The user started by connecting to the web portal from a mobile device at <http://192.168.0.108:8081>. Once loaded, the user had the option to install the web application onto their phone via the *Add to Homescreen* feature available on most standard mobile web browsers. On the web app splash screen, pairing supported devices commenced the user pressing in the top right menu *Add a Device*. The user started pairing sonos devices by tapping *Connect to Sonos Devices*. The user was presented with a list of Sonos speakers on the network, tapped on *Pair device*, and was presented with the newly added device in the device list view. The user repeated these steps above to add the remaining Sonos and Wink devices.

0.3 Conclusions

The set-up process represented a key aspect of making the Ventana experience easy and intuitive for a user. Having the user successfully navigate through these steps confirmed that this process is an effective means of running Ventana, initially. Furthermore, the web portal provided information to the user at any time, so she was able to check the status of devices connected to the HoloHub, and HoloLens. In the future, when a user needs to add a new device to Ventana, she will utilize this web app.

1.0 Set Up Holograms

1.1 Description and Goal

The purpose of this test was to initialize the holograms in the Ventana application on the HoloLens, using VuMarks and the Vuforia Software Development Kit. This test also allowed the user to attach the holograms to permanent locations in the room they were in during the test. The user's goal was to place at least one of each controller, specific to a device, in the room after generating the controller from the VuMark of the specific device.

1.2 Procedure and Results

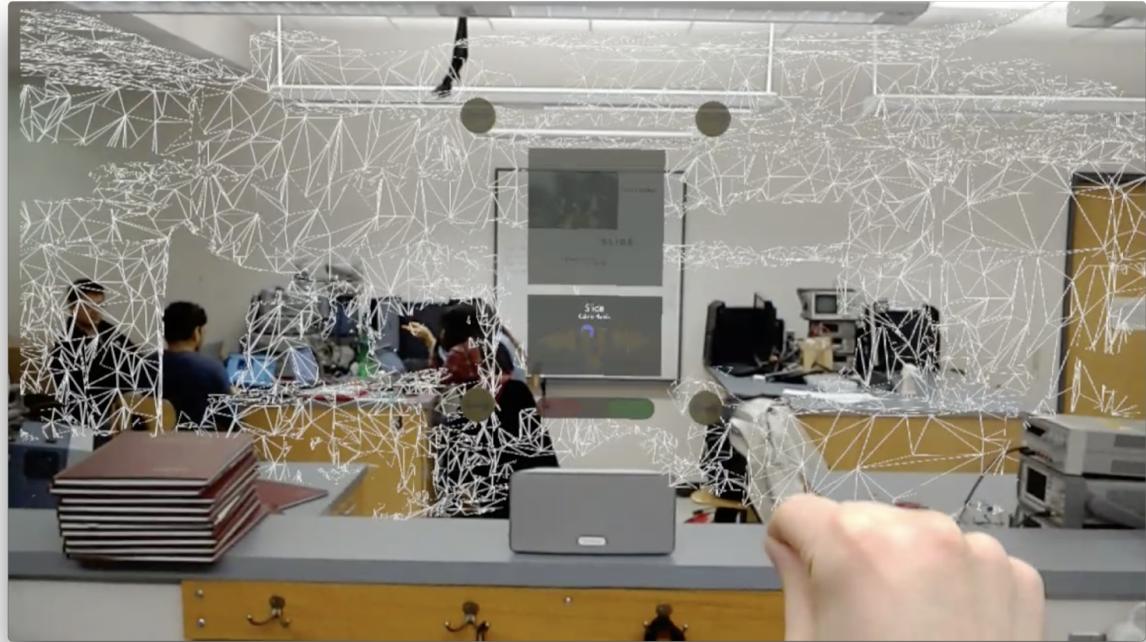
To start, the user opened Ventana through the bloom menu on the HoloLens. This launched the application showing the Ventana logo while it was loading and once finished loading it presented the start screen with two options: start new session and load last session. When the user air tapped “start new session” the application started a new session without any previous holograms generated. The user then created a new hologram by loading a VuMark through the HoloHub web app and looking at it through the HoloLens.



The hologram correctly spawned on the VuMark and was tracked correctly in translation and rotation. The user then air tapped, held, and then released to create a new copy of the hologram.



The new copy of the hologram spawned in the edit mode and the user air tapped, held, and dragged it to the desired location.



When the user tapped the green “Done” button the hologram leaves edit mode. This was then repeated for all of the devices we wanted to control including the two Sonos speakers and three wink devices.

1.3 Conclusions

The entire process of setting up holograms worked exactly as expected. This step of the along with step 0 make up the entire setup process. After this the entire application is ready to use. A user can add or delete holograms in there space at any time, but at this point the Ventana application is ready to use.

2.0 Control Multiple Sonos Speakers Simultaneously

2.1 Description and Goal

Ventana has the capability to control multiple Sonos speakers at the same time, so a test was needed to ensure that each of the spawned controllers worked. This tests the functionality of each controller individually to see if functions like play, pause, next, and previous function as expected. This includes seeing a significant change in volume after a user interacts with the volume slider, a change in album artwork when a song change was detected, and a song title that matches the data that is being displayed on the Sonos application that is feeding Ventana information.

2.2 Procedure and Results

The first step in verifying the functionality of the Sonos module was to ensure that the speakers in question were currently playing music. This was important since the Sonos API that is being used can only interact with devices that are currently in use on a local network. Once this had been ensured, the user utilized gaze to point to the controller associated with the Sonos Play:1 and interacted with the controls available to them. At each interaction, the user saw the changes reflected on the Sonos Play:1 that they had paired to that controller.

When the user interacted with the play/pause button, they saw that the song stopped or resumed playback. Similar results occurred with the next and previous buttons with the exception that these buttons caused a change in the song metadata that the controller displayed. Mainly album artwork and the track’s name.

Lastly, the user was able to air tap and hold the volume knob in the center of the slider and drag it to a location that they found acceptable in order to trigger a volume change on the Sonos speaker. All of these interactions are limited to the Sonos device that is currently connected to the VuMark that was spawned and was verified with the Sonos application that is paired with the speaker as well. The test was continued on a second Sonos speaker and, as expected, the user saw only the controllers they were interacting with change.

2.3 Conclusions

In showing that the team could send commands to a specific Sonos speaker, the team was able to prove that they were capable of supporting more than one speaker or group of speakers in a home network. In addition to the above, obvious support for fast messaging between the Node.Js Backend and the HoloLens application was added, which allowed for a considerably faster method for changing track metadata within the application using websockets.

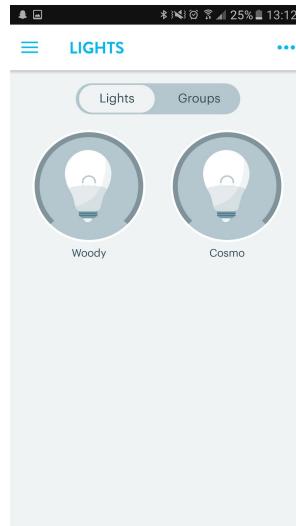
3.0 Control Multiple Lights

3.1 Description and Goal

This test showed that the functionality of the lights within the Ventana application is complete. The two light bulbs used are GE Link Light Bulbs, connected to the Ventana Wink account through the Wink Hub device. These tests showed that these lights are controlled with the Ventana application through the HoloHub server. The lights were individually turned on and off and the brightness of the bulbs were adjusted individually as well.

3.2 Procedure and Results

The first step of this test was to confirm that the two smart lights, both GE Link Lights from Wink, were in the off state. This was done by opening the Wink application and checking to make sure both lights associated with the Ventana Wink account had grey icons, which symbolizes the off state, as shown below..



The user then directed the gaze cursor at the controller associated with the first light. The user performed a HoloLens airtap while the gaze cursor was over the rectangular button on the light controller, which turned on the light associated with that specific controller. To test the brightness slider, the user dragged the brightness slider to the left. The brightness of the bulb visibly went down and the brightness level was confirmed to go down by looking at the brightness level in the Wink application. The slider was then dragged to the right by the user, visibly increasing the brightness of the bulb, which was

confirmed by looking at the brightness level of that bulb on the Wink app. The user then pressed the power button on that controller again, which shut the light off. This process was repeated for the second light and to do this, the user looked at the controller that was specific to second light bulb. The results were verified in the same way for the second bulb.

3.3 Conclusions

By demonstrating the power toggle and brightness slider functionalities on two separate Wink Light Bulbs, the team has completed support of a second device, the GE Link Light Bulb from Wink. This integration also demonstrated that Ventana can and does support multiple manufacturers of devices through the manufacturer API. The integration of this Wink light allowed the team to more easily integrate the third device, the power strip.

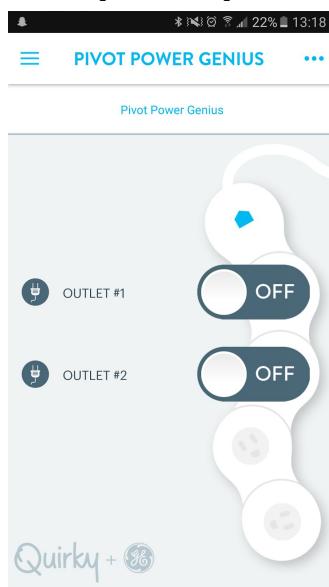
4.0 Control Both Outlets on Power Strip

4.1 Description and Goal

The Pivot Power Genius from GE and Quirky is the third type of device controlled by Ventana. This test examined both the functionality of the server's ability to handle requests to toggle two of the outlets on the power strip on and off and the ability of the HoloLens to send and receive requests for the power strip to and from the Wink Module. The outlets on the powerstrip were individually and consistently turned on and off by the Ventana application to demonstrate that Ventana supports three separate types of devices.

4.2 Procedure and Results

The first step was to verify that the two outlets on the Pivot Power Genius powerstrip were turned off by looking at the Wink Application on a smartphone, and looking at the specific screen for that powerstrip, as shown below.



Then the Ventana user directed her gaze pointer at the powerstrip controller. When the gaze pointer was directed over the left button on the powerstrip controller, the button was highlighted. The user performed an airtap and the Ventana application made a feedback click noise as the first outlet turned on, resulting in the fan that was plugged into it turning on. The user then clicked the right button on the powerstrip controller and the iPad that was plugged into the second outlet began to charge. The user then clicked the two power toggles again, shutting off the outlets, cutting the power off to both the fan and the iPad.

4.3 Conclusions

This test demonstrated that Ventana and the HoloHub support a third Wink device, the Quirky Pivot Power Genius. The device is fully supported through Ventana's ability to toggle the power of the separate outlets individually and through one controller. The team also used this to demonstrate the modularity of Ventana and the HoloHub, especially in relation to add more Wink devices easily and efficiently.

5.0 Test Hologram Persistence Across Multiple Sessions of Ventana

5.1 Description and Goal

This test examined Ventana's capability to store and load the appropriate holograms through the World Anchor Manager. This allowed the user total control to place holograms at a desired position in a room, fully close the application, and still have the holograms in those same positions upon relaunching the application.

5.2 Procedure and Results

The user made note of the current locations of the holograms, and closed Ventana. To close the application, the user did a bloom gesture, found the Ventana application tile, and tapped the remove button in the top right corner of the tile. The user did not see any of Ventana's controllers, or its application window, once the application was exited. Once the user exited the application, she did a bloom gesture again to open the HoloLens' main menu, and tapped to select Ventana from the list of applications, in order to relaunch the program. The user saw the Ventana logo to indicate that the application has been launched, and was in the process of loading. From Ventana's Welcome Scene, the user tapped to select "Load Last Session." The Welcome Scene disappeared, and the Ventana Scene loaded. The user saw the blue, circular cursor to indicate the scene has finished loading. The user looked around to verify that Ventana has reloaded the appropriate holograms in the correct positions. The user interacted with at least one of the buttons, on each of the holograms, to ensure that they had each been functionally restored, as well. The user saw the holograms restored to the same positions as the previous session, and experienced the normal user feedback when the user selected a button.

5.3 Conclusions

Successful completion of this test proved that Ventana can utilize the World Anchor Store for the persistence of holograms across sessions. Positional tracking represented one of the main requirements of Ventana, and the hybrid utilization of Vuforia and World Anchors achieved this. With World Anchors incorporated into Ventana, the user can utilize Vuforia for initialization of each of the holograms, and then rely on World Anchors to ensure that the holograms persist across sessions of the application.

6.0 Test Edit Mode Functionality

6.1 Description and Goal

This test observed the quality of the user's experience, while manipulating Ventana's holograms at runtime. After the user spawned a new controller through a tap, hold, and release gesture on a VuMark's controller, the new controller appeared in "edit mode." This mode included four scaling handles, one at each corner of the controller. The user clicked and held the body of the hologram to drag it to a new location. The user deleted the hologram, when she no longer needed it. This simply deleted that instance of the hologram, therefore the user could still have other holograms of that same controller elsewhere in the room, or looked at the VuMark that corresponded to the controller to see another instance of it. Lastly, when the user finished making these edits, the done button returned them to "regular mode." If the user wished to enter edit mode again, the user gazed down, below the controller, and tapped on the more button that appeared. The test focused on the functionality of the aforementioned controls, as well as the user's overall experience when interacting with them.

6.2 Procedure and Results

The user looked below a hologram and tapped the "More" button, then tapped and held the body of the hologram, and dragged it to a new location. A black and white wireframe of the room appeared, for as long as the user held and dragged the hologram. When the user was satisfied with the hologram's location and stopped holding it, the black and white wireframe disappeared. The user tapped and held the bottom left scaling handle and moved hand across the HoloLens' field of vision. This step was repeated with the other three scaling handles in the other corners of the controller. The hologram increased in scale when the user dragged right and decreased when dragged left. The change in size of the controller was proportional to how far the user moved her hand across the HoloLens' field of vision. The user tapped the green done button, at the bottom of the controller. The scaling handles, delete button, and done buttons disappeared. The user still saw the regular controller. The user gazed down, below the controller, and tapped the "More" button. The scaling handles, delete button, and done buttons reappeared. The user was able to interact with them, as she did previously. The user tapped the red delete button, at the bottom of the controller. The hologram was removed from the user's room.

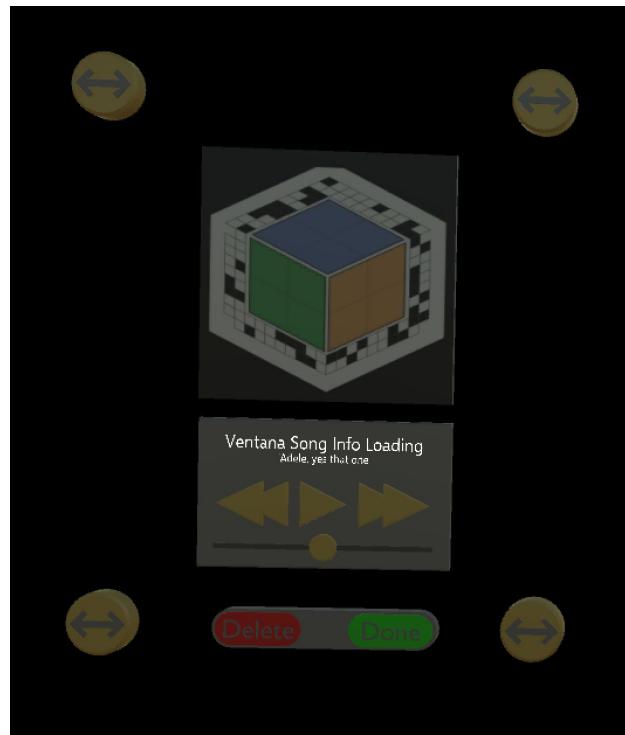


Figure 6.2.1: Edit Mode Controls with Music Controller (Shown in Unity)

6.3 Conclusions

The test examined the overall user experience with increased customization incorporated into Ventana. The ability to modify holograms in real time provided the user with more freedom to personalize the Ventana experience to support her needs. Since Ventana strived to make technology in the home easier to use, it was important that the user found Ventana not only simple and intuitive, but also something that complements the physical world, and personal customization of controls enabled this feature.