'Team MacroHard: The Perfect Selfie
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Intro:

The project is an integration of a drone, a video recording device, and a smartphone application that is capable of recognizing voice commands, using the drone to automatically orient a video recording device with respect to a subject, and uploading photos taken from the video device to a cloud storage media. It addresses the problem that arises when the subject is unable to take the ideal video recording or picture of him/herself due to the physical limitations posed by the subject having to physically hold the device. In order to accomplish this task, the project introduces two new innovations: interface between the drone's built in processor and the voice recognition software in the smartphone, and the use of the drone's processor to automate its movements.

Glossary of Terms:

- **Cortana** - A personal assistant created by Microsoft that mainly interacts with the user through voice commands..
- **AR Parrot Drone** - Quadcopter with inbuilt processor and smartphone communication infrastructure.
- **TCP** - Processes level communication protocol involving dedicated socket connection.
- **UDP** - Process level communication protocol without dedicated socket connection.
- **Windows 8.1 SDK** - The software development kit develop apps on the windows phone.

System Architecture Overview:

There are three main components for this project: the windows phone 8.1 (and app), the AR Parrot Drone, and Cortana voice commands.

<u>The phone</u> is going to be the main component in this system because it serves as the interface between the Cortana voice commands and the Drone.

<u>Phone/Cortana</u>: The phone will process the voice commands, some of which will open and start running the app. The phone app will take these commands and translate them into various functions and actions.

<u>Phone/Drone</u>: The phone will translate the voice commands given into functions the drone can use. The Drone is only in charge of maintaining its flight and position, adjusting to commands given, taking a photo/video, and sending that photo/video back. Because of the small amount of processing power on the Drone, the phone will be doing all the processing. The two will communicate via a wifi connection, using both UDP and TCP.

Requirements:

Use Case: Voice Command to Cortana
Actors: Photo Subject, Windows Phone
Precondition: Subject of photo is on the start page after starting app.
Flow of Events:
- Expected
    - Cortana indicates that it is accepting voice commands
    - Voice command is issued by subject
    - Cortana turns voice command into a specific action that app can execute
    - App executes the action specified
- Alternate
    - If voice command given is not an acceptable action that the app can execute:
        - App notifies the user that action cannot be executed
        - App prompts user for another voice command

Postcondition: Phone processes the subject's voice command and performs the necessary action

Use Case: Tell drone To Take Off
Actors: Photo Subject, Drone, Cortana, Windows Phone
Precondition: Drone is positioned in a clear area and windows phone app is on the start page
Flow of Events:
- Expected
    - Subject issues command to drone to take off
    - Drone raises to a height previously specified
    - Drone starts transmitting live feed to photo user
- Alternate
    - Drone faces obstacles when taking off
    - Drone safely lands and notifies user that takeoff is not possible

Postcondition: Drone is in the air and transmitting live feed to photo subject

Use Case: Take Picture
Actors: Photo Subject, Drone, Windows Phone
Precondition: Drone is in the air and transmitting live feed
Flow of Events:
- Expected
    - Photo subject issues button command to take picture
    - Drone takes picture and transmits picture to phone
    - User is able to view pictures in phone picture library
- Alternate
    - Drone is unable to establish connection with phone

○ Phone returns a message saying that connection is unable to be established

Postcondition: Picture is taken and displayed on the phone picture library.

Use Case: Drone Actions in the Air

Actors: User, Windows Phone, Cortana, Drone

Precondition: Drone is in the air and transmitting live feed

Flow of Events:

- Expected
    - User issues voice command for drone to reposition itself (pan right, pan left etc.)
    - Drone repositions itself and transmits new live feed to user
- Alternate
    - Drone faces obstacle in repositioning itself
    - Drone notifies Windows Phone app that action requested is not possible.

Postcondition: Drone performs requested action in the air and is transmitting new live feed.

Use Case: Drone Landing

Actors: User, Windows Phone, Cortana, Drone

Precondition: Drone is in the air and is transmitting live feed

Flow of Events:

- Expected
    - User issues voice command for drone to land
    - Drone stops transmitting live feed
    - Drone descends until it safely lands
- Alternate
    - Drone is unable to establish connection with user
        - Windows app notifies user that connection cannot be established
    - Drone is unable to land due to obstacles
        - Drone notifies windows app that landing is not possible

Postcondition: Drone is no longer transmitting live feed and is on the ground.

Use Case: Change Speed Settings

Actors: User, Settings user interface, Drone

Precondition: User is on the settings page and sees the speed slidebar

Flow of Events:

- Expected
    - User slides slidebar to expected speed setting
    - Slidebar moves to requested speed setting and displays new speed on the right
    - Drone receives new speed setting
    - Drone sends confirmation of new speed setting
- Alternate
    - No alternate this should work in all cases unless connection is lost

Postcondition: Drone is unable to move faster than specified speed setting.

Use Case: Change altitude settings
Actors:User, Settings Page Interface, Drone
Precondition: User is on the phone settings page and is able to see altitude slider
Flow of Events:
- Expected
    - User moves altitude slidebar to desired altitude
    - Slidebar moves to requested altitude and displays new altitude on the right
    - Drone receives new altitude setting
    - Drone sends a confirmation to the user that altitude setting has been changed
- Alternate
    - No alternate this should work in all cases unless connection is lost

Postcondition: Drone is unable to fly higher than specified altitude

Use Case: Change Photo Distance
Actors: Photo Subject, Settings Page Interface, Drone
Precondition: User is on the phone settings page and is able to see Photo Distance level
Flow of Events:
- Expected
    - Photo Subject selects desired photo distance
    - Selected photo distance button is highlighted
    - Drone receives new photo distance setting
    - Drone sends a confirmation to the user of new photo distance setting
- Alternate
    - No alternate, this should work in all cases unless connection is lost

Postcondition: Drone will now move at the desired distance away from the photo subject before taking picture.

Use Case: Record Video
Actors:Photo Subject, Windows Phone app to Drone interface, Drone
Precondition:Drone is in the air transmitting live feed
Flow of Events:
- Expected
    - User gives drone a recording command through the button interface (click recording icon)
    - Drone starts recording and windows phone app displays recording icon
    - User gives drone a stop recording command through button interface (click recording icon)
    - Video recording stops and is stored on phone picture library
- Alternate
    - Connection is lost in between the recording

- ■ Recording is stopped and drone sends signal that this is the case
  - ○ Windows app stores recording in phone picture library

Postcondition: Video recording is stored in phone picture library.

Use Case: Upload photo/video recording to Cloud

Actors: User, Windows Phone application, Microsoft One Drive

Precondition:Photo/Video Recording is in phone picture library

Flow of Events:
- Expected
  - ○ User tells clicks on upload picture on cloud upload page on app
  - ○ User selects the picture/video recording that he/she wishes to be recorded
  - ○ Photo is uploaded to the cloud storage
- Alternate
  - ○ Wifi connection is lost
    - ■ Phone returns message indicating that wifi connection is lost.

Postcondition: Picture/Video Recording is uploaded to Cloud

Appendices:
- Mobile App
  - ○ Windows Phone 8 App created using C#/.NET framework
  - ○ Using Cortana to interpret voice commands and translate them into commands for the drone to follow
  - ○ Access camera and allow app to upload pictures to different social media sites/cloud
- Communication Technology
  - ○ WiFi network between Drone and Smartphone
  - ○ C# ArDrone SDK
    - ■ allows us to communicate and speak the same language as the drone, passing in commands it already uses.
- Hardware
  - ○ Parrot ARDrone 2.0
    - ■ Features: GPS, WiFi connectivity, Dual cameras (one HD, one low res), magnetometer, 3-axis gyroscope, accelerometer, barometric sensor and ultrasound sensor.
  - ○ Windows Phone 8.1