DRONE MISSION PLANNING SOFTWARE

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OVERVIEW

- Problem Definition
- Project Status
- Goals & Plans
- Hardware
- Communications

- GUI
- Demo
- Q & A

PROBLEM DEFINITION

The goal of this project is to design and develop a graphical user interface (GUI) for drone mission planning.

Requirements:

- User friendly interface

- Allow 3D mission planning

- Upload the flight plan using XAPI and Xbee

- Allow Manual Override during flight

- Implement Drone Hardware for flight control

PROJECT DELIVERABLES

- ALPHA VERSION OF GRAPHICAL USER INTERFACE (GUI)

- INTEGRATED PROTOTYPE INSTRUMENT PANEL INTO GUI (CODE BY GUILLAUME CHOUTEAU)

- ARDUINO FIRMWARE FOR HOME AND DRONE WITH XAPI AND DRONE SERVICES

- BASIC COMMUNICATIONS INTEGRATED WITH DRONE AND GUI

- FULLY CONFIGURED DRONE HARDWARE

  - INITIAL DRONE PROTOTYPE FIRMWARE

HARDWARE

Speed Controller Bin
V4

David Klingenberg
1/27/2015

A3

SCALE   WEIGHT   NUMBER   SHEET

Battery Mount
V5

David Klingenberg
2/12/2015

A3

SCALE   WEIGHT   NUMBER   SHEET

ARDUINO PLATFORM
V7

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3/3/2015

A3

SCALE   WEIGHT   NUMBER   SHEET

HARDWARE

FIRMWARE

- Arduino firmware uses xapi to manage services that control different aspects of communication

- Home firmware for Arduino connected to Windows PC running mission control software

  - relays packets, over a serial connection, to the Arduino then over xBee modules to drone Arduino

- Drone firmware for driving flight computer

  - Enables automatic or manual control

  - Auto pilot manipulation via xapi services we developed

FIRMWARE
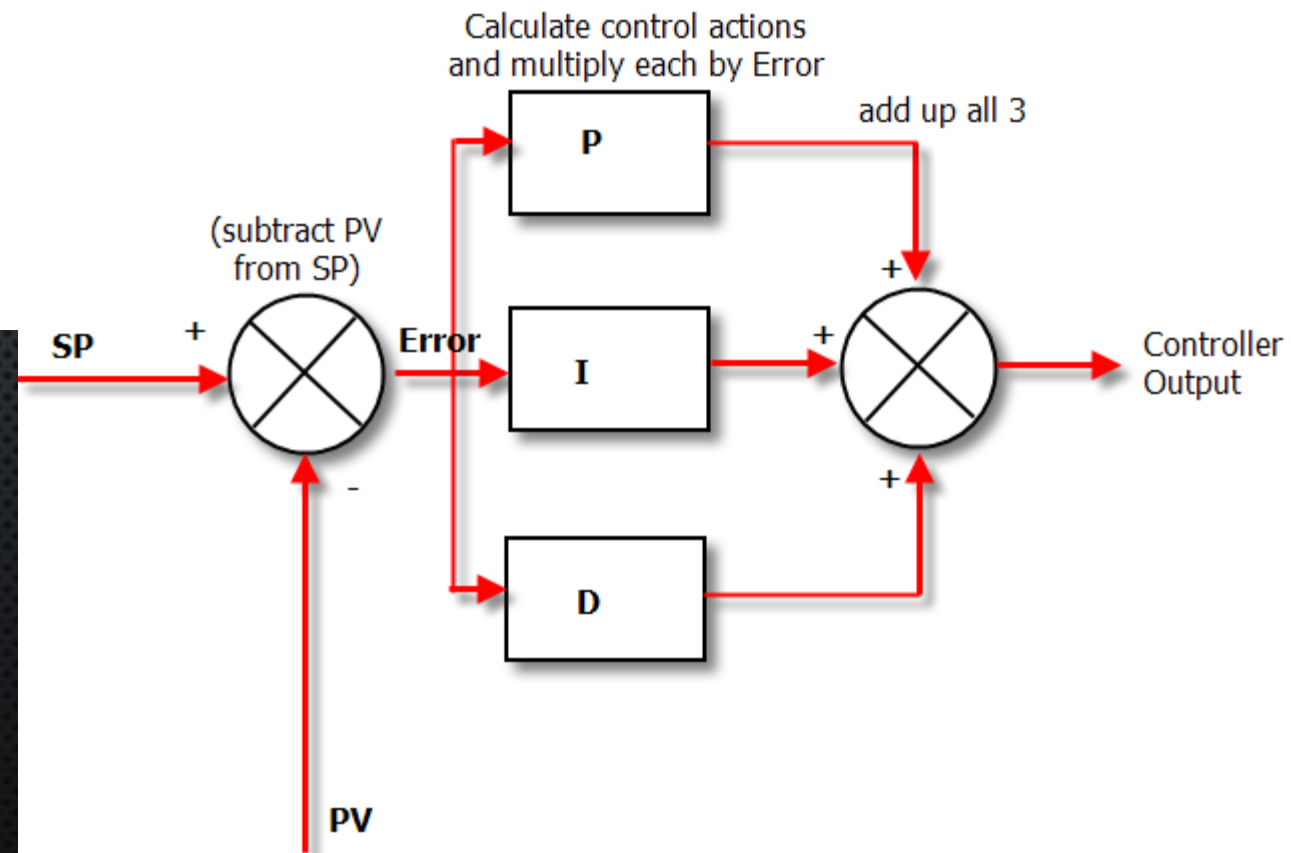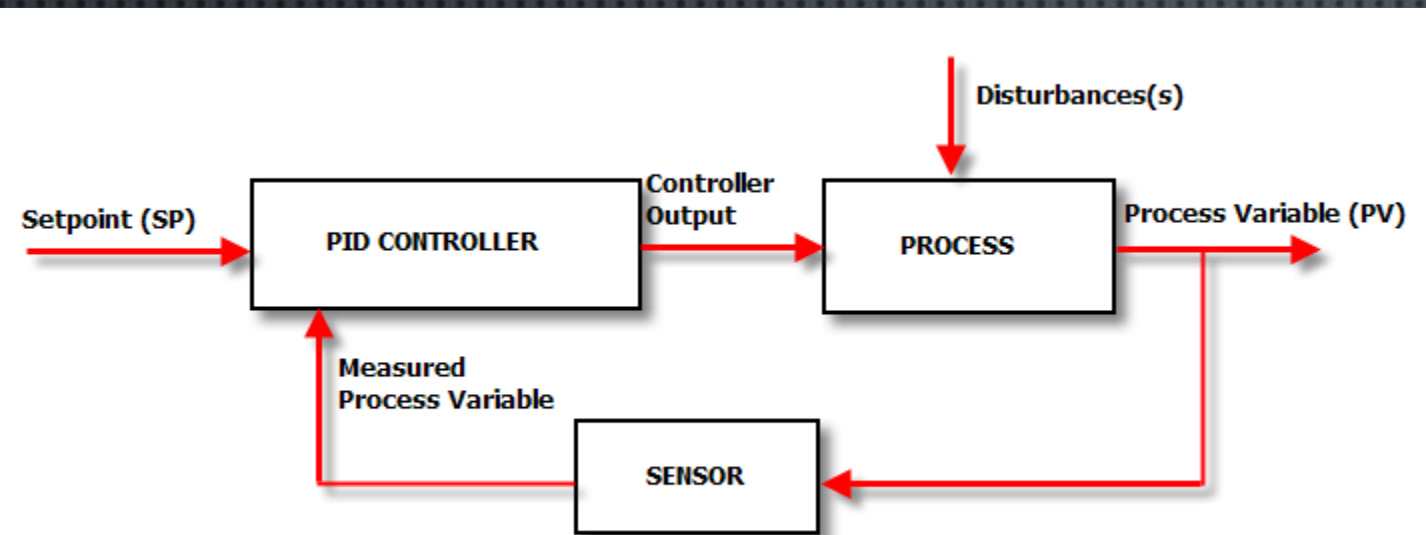
COMMUNICATION DESIGNS
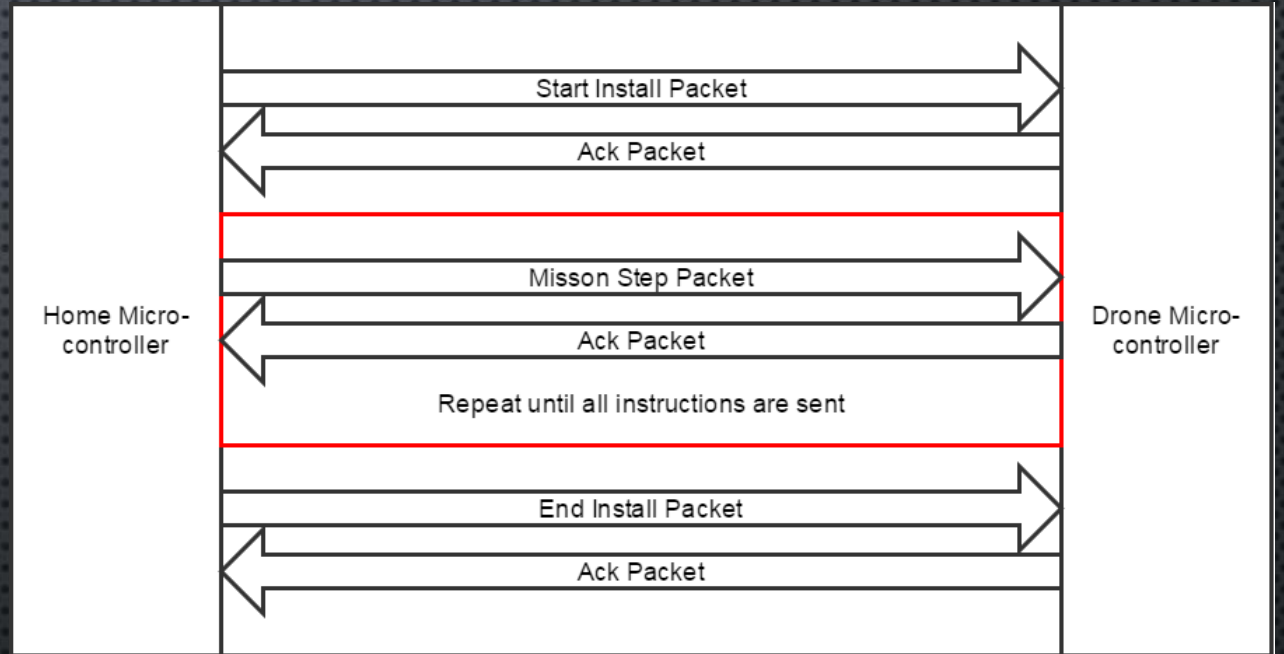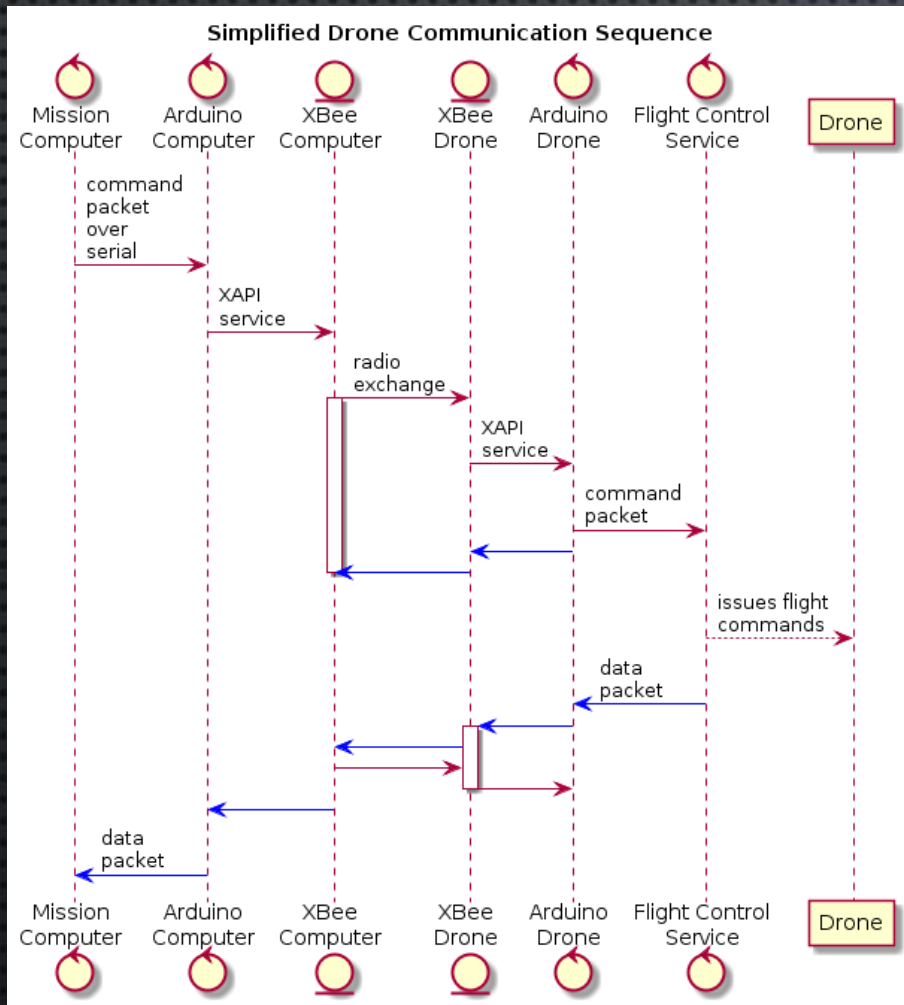
COMMUNICATION PACKET TYPES

TUN Type Key Internal/External	Payload	Use
0x50/0x51	Altitude	Take off and maintain specific altitude
0x52/0x53	N/A	Land
0x54/0x55	X,Y,Altitude	Go to specific coordinate
0x56/0x57	MoveDirection,Amount,Metric	Carry out specific move (Forward/Back/Left/Right/Rotate)
0x58/0x59	N/A	Start mission plan upload
0x60/0x61	X,Y,Altitude	Mission instruction - go to specific coordinate
0x62/0x63	MoveDirection,Amount,Metric	Mission instruction - carry out specific move (Forward/Back/Left/Right/Rotate)
0x6A/0x6B		Instruction - Land
0x6C/0x6D	Altitude	Instruction - Take off and maintain specific altitude
0x64/0x65	ChecksumValue	End install and check checksum to validate success
0x66/0x67	N/A	Stop current mission plan and activate manual control (maintain altitude)
0x68/0x69	N/A	Stop current mission plan and activate manual control (no longer autonomous)
0x70/0x71	N/A	Acknowledgment (ACK)
0x72/0x73	N/A	Acknowledgment of issue (NACK)
0x74/0x75	InstrumentData	Heartbeat that contains the drone's current state
0x76/0x77	Altitude	Set altitude
0x78/0x79	Speed	Set the never exceed speed
0x80/0x81	Speed	Set never exceed fall speed
0x82/0x83	Throttle	Set throttle
0x90/0x91	On/Off	Set drone armed status
0x92/0x93	Heading	Set drone heading for auto pilot
0x94/0x95	HoldAltitude	Set drone to hold altitude (true/false)
0x96/0x97	HoldHeading	Set drone to hold heading (latitude/longitud

SERVICES (FULLY IMPLEMENTED)

- AltitudeHold Service

- Arm Service

- DoMove Service

- Heading Service

- HeadingHold Service

- Land Service

- Updated Serial Service

- Takeoff Service

FUTURE SERVICES REQUIRED

- Heartbeat Service (In progress)
- MissionPlanInstruction Service
- MissionPlan Service
- Move to Coordinate Service
- DroneSettings Service

MISSION CONTROL SOFTWARE

FLIGHT PLAN PANEL

- ABLE TO CREATE AND SUBMIT FLIGHT PLANS WITH MANY INSTRUCTIONS.

- INSTRUCTIONS IMPLEMENTED:
  - MOVE: FORWARD, LEFT, RIGHT AND BACK
  - ROTATE: LEFT RIGHT

- INSTRUCTIONS CAN BE ADDED AND SUBTRACTED BEFORE BEING RESUBMITTED.

- EMERGENCY BUTTONS FOR PAUSING FLIGHT AND FORCING A LANDING ARE CLEARLY INDICATED.

Flight Planning System
+

Move | Forward | 4 | meter | -
Rotate | Left | 20 | degrees | -
Move | Left | 4 | meter | -
Move | Back | 5 | meter | -

Hold Position | Submit Flight Plan | Emergency Land

MISSION CONTROL SOFTWARE

MANUAL CONTROL PANEL

- CONTROLS CAN BE ACTIVATED OR DEACTIVATED

- CONTROLS CAN USE EITHER KEYBOARD KEYS OR MOUSE CLICKS.

- FUTURE IMPROVEMENTS:

  - DATA DISPLAYS NEED TO BE UPDATED FROM THE DRONE PACKET.

  - RESTRICT KEY SELECT TO ONLY ONE KEY AT A TIME.
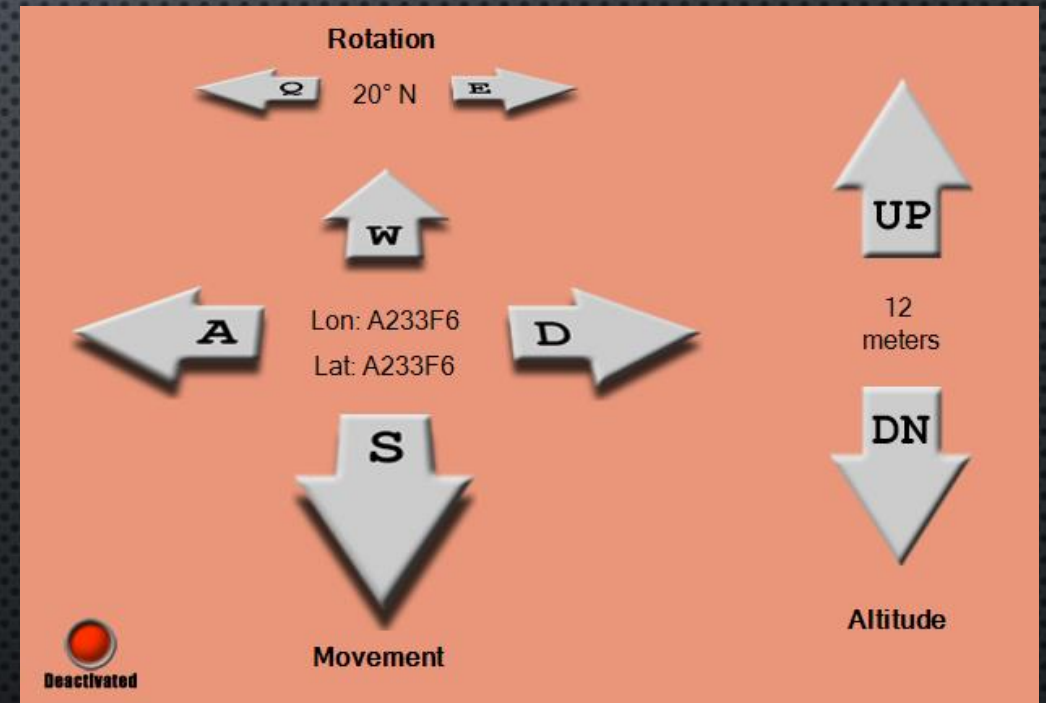
MISSION CONTROL SOFTWARE

Instrument Panel

- Library courtesy of Guillaume Chouteau

- Currently monitors the pitch, roll and yaw of the drone's Ardunio

- String parsing extrapolates the data and then translates to a format readable by the instrument panel library.
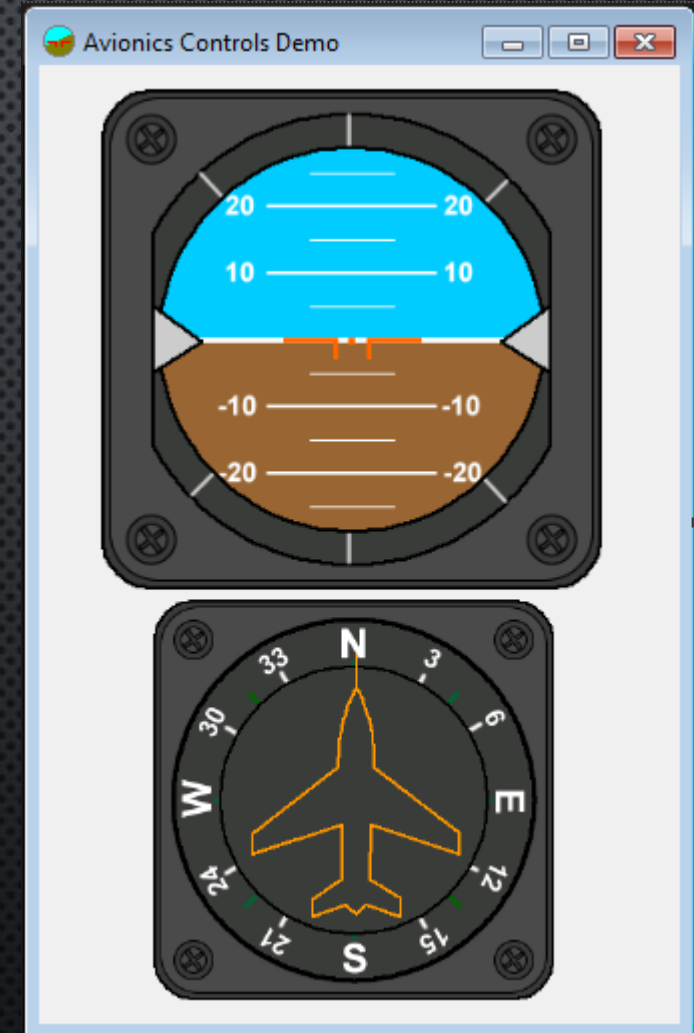
TESTING (AUTO PILOT)

THANK YOU

QUESTIONS?