PROGRESS REPORT:

QUICKSCAN MAPPING DEVICE

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1. Introduction

This document will outline the overall progress in the development of the QuickScan prototype. Dimension Technologies is creating the QuickScan module to assist drafters and builders during the floor planning and dimensioning process. The QuickScan will create a 3D render of a given room. Room dimensions can be extracted using the interactive QuickScan GUI. An overview of device's and subsystem's progress will be mentioned in the following section. Additionally, a budget overview will also be tabulated.

1.1 Human Resources

The team dynamics of our design group are functioning quite well. Overall, we are working well together and making excellent progress as a group. Regular weekly meetings are held with all group members present. Topics include overall progress, subsystem progress, and deliverables & deadlines. Other design and technical issues are also discussed in such meetings.

1.2 QuickScan Status

Overall our team has made significant progress in the creation of our prototype. Figure 1 displays our planned deadlines and target dates. As seen in the figure, our team has been able to meet specific deadlines. Currently, we are working on future tasks which will lead to a successful QuickScan prototype.

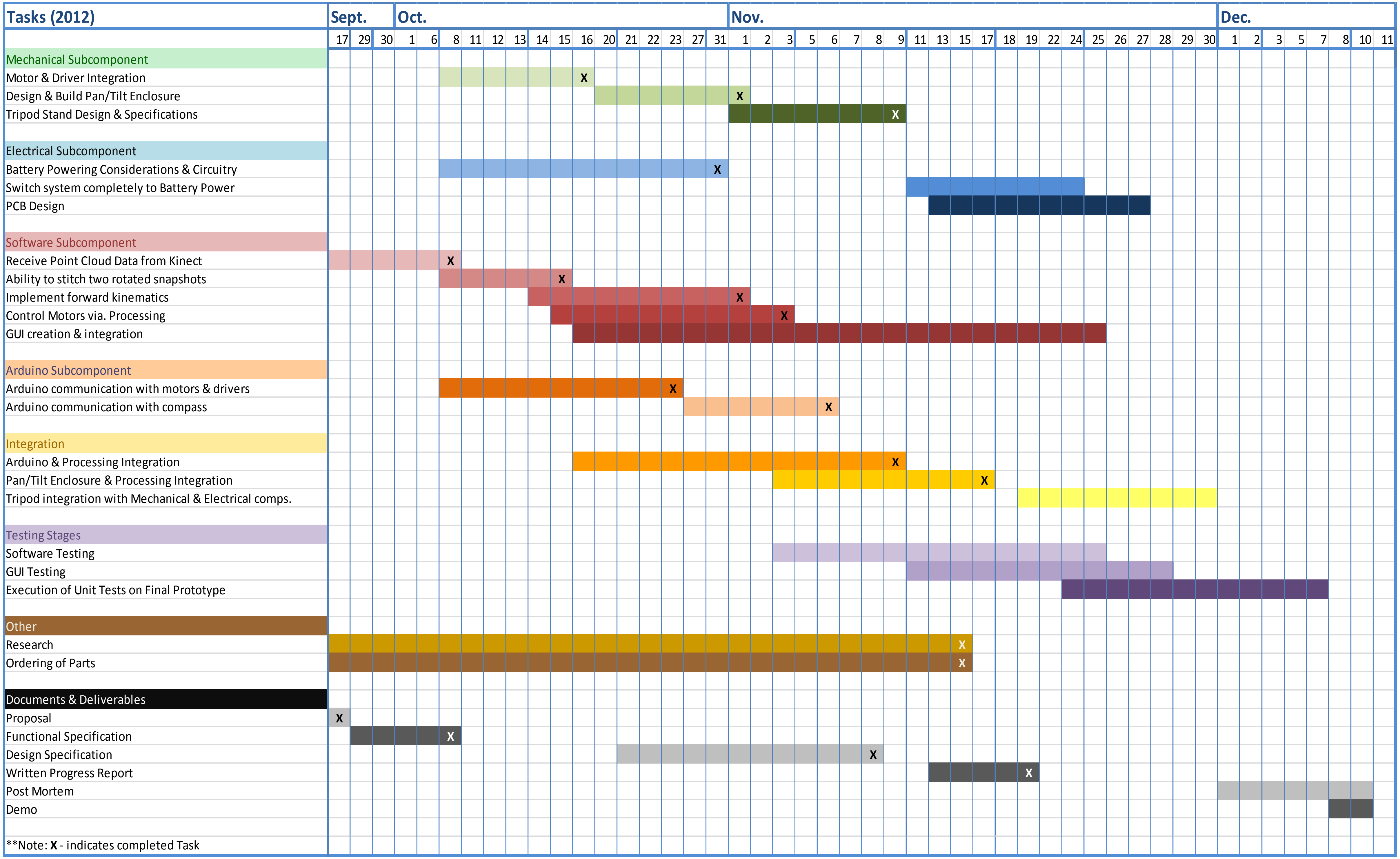

Figure 1 QuickScan Schedule

2. Subsystem Progress

2.1 Mechanical Subsystem

The mechanical subsystem consists of the motors, motor drivers, pan/tilt enclosure and entire device enclosure. Together the motors and motor drivers enable horizontal and vertical rotation of the device platform. This is to enable maximum room coverage given the Kinect's limited acquisition range. The device enclosure mainly consists of a tripod.

Milestones Reached:

- Pan/tilt enclosure designed & created
- Motors and motor drivers controllable via. Arduino
- Tripod has been ordered

Upcoming Milestones (action items):

- Add gearing mechanism to pan/tilt enclosure
- Integrate all modules (mechanical & electrical) onto physical tripod for final prototype delivery

2.2 Electrical Subsystem

The electrical subsystem encompasses the PCB design component and battery powering circuitry. We opted for a PCB design in order to create a more robust and compact electrical subcomponent. The battery powering circuitry will be used to power the entire device using a single battery, eliminating the need for external power connections.

Milestones Reached:

- Battery figures of merit (total current needed, operating voltages, expected time, etc.) have been calculated
- Battery has been selected and ordered based on above calculations
- PCB design material has been ordered and will arrive shortly

Upcoming Milestones (action items):

- Complete PCB design (integrating all sub-electrical modules and components)
- Switch entire device to battery powering circuitry

2.3 Software Subsystem

The software subcomponent consists of data processing and the project GUI. The data processing software will interact with the Kinect and Arduino and process the point cloud data appropriately. The GUI will serve as the main source of interaction between the user and the QuickScan device.

Milestones Reached:

- Arduino communication with motors and compass has been completed
- Forward Kinematics have been implemented in Processing
- Able to communicate with Kinect and Arduino via. USB connection laptop
- Overall GUI design has been created

Upcoming Milestones (action items):

- Need to focus on data stitching – high level of accuracy in stitching different point cloud shots is needed
- All code needs to be migrated into GUI for final testing

3. Budget

Table 1 compares our original estimated budget, with our actual current budget. We were granted $550.00 from the ESSEF funding source. From the table it is clear that we are about $190.00 lower than our initial estimated budget. We have been fairly prudent in our parts purchasing and have found relatively cheap prices from different sources. All the parts for our project have been purchased – thus the amounts in the table below are close to final values.

Table 1 QuickScan Budget

Component	Estimated	Actual
Development Board – Arduino Mega 2560	$55.00	$10.99 [1]
XBOX Kinect	$125.00	$80.00
Scanner Chassis Kit	$80.00	$40.63
Servo Motor	$20.00	$29.90 [2]
Arduino Bluetooth Module	$30.00	$0.00 [3]
Batteries/Charging Kit	$100.00	$30.00
Custom PCB Board Design	$150.00	$1.98 [4]
HMC5883L Compass	$30.00	$15.00
Miscellaneous – Wires, cables, etc...	$50.00	$240.00 [5]
Total	$640.00 CAD	$448.50 CAD

[1] Dimension Technologies has determined that and Arduino Nano will be sufficient for the scope of our product – this has greatly reduced the costs on our development board

[2] In early October we had decided to use stepper motors instead of servo motors due to the stepper's higher step accuracy; thus this component has increased costs

[3] Bluetooth connectivity is a feature that Dimension Technologies had originally planned to implement. However, due to increased costs and complexity, we have decided not to pursue this functionality

[4] Initially, we had decided to create a custom PCB design. This would involve creating a PCB schematic layout using a CAD program. This could then be given to a PCB manufacturer to design a custom PCB for our project. However, we have opted to create a 'home-made' PCB design for this prototype – hence the reduction in costs.

[5] This amount includes miscellaneous items such as:

- Pan/tilt enclosure design and construction – includes plywood, screws, nuts, bolts, and gears
- Research materials – We initially felt it was better to design our rotation and tilt enclosure using servo motors. After testing the servos we felt they were not as accurate as we desired. Thus we moved onto stepper motors. However, the amount spent on the servos could not be recovered.

- Shipping costs – Many of the amounts in the above table do not include shipping charges. In many cases, items were being shipped from an international source which needed to be expedited in order to ensure timely delivery of parts.
- Various cables and other costs.

4. Conclusion

In this document we have outlined our overall project progress. All our subsystems have met their respective deadlines shown in Figure 1. In summary, the major milestones that need to be completed in the coming weeks are:

- Pan/tilt enclosure needs to have a gearing mechanism integrated in the module to allow a larger degree of vertical tilt
- Entire device needs to switch to battery power
- Software processing needs to finalize stitching algorithm and meet a high level of stitching accuracy
- All software code must be migrated into Quick Scan GUI for final testing and prototype demonstration
- Final testing of device – includes executing units test mentioned in previous documents

Overall, we feel that Dimension Technologies has met all its key deadlines and will be able to meet a prototype demonstration date of December 10th, 2012.

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