Small Scale Motion Table

Kevin Ryan, Derrick Duran, Juan Lopez

NEW MEXICO TECH
SCIENCE • ENGINEERING • RESEARCH UNIVERSITY

Background & Objective

- **Purpose:** Design, build, and test a motion simulation platform that is capable of producing ocean-like motion in terms of emulating the pitch & roll conditions of waves.
- **Significance:** This type of simulation is used to test how radio communication systems will behave on ships that are experiencing different levels of ocean wave intensities.
- **Implementation:** Two independent DC motors being driven by an Arduino microcontroller are used to produce the periodic table motion.

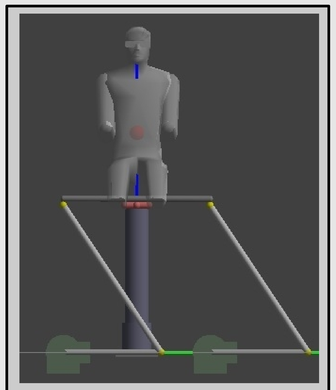

Figure 1. Conceptual Design

Design Specifications

- The specifications as listed in Table 1. were determined jointly by the design team and Raytheon-Ktech.
- The conceptual design for this project was created in the Motion Platform Designer program as seen in Figure 1.

Specification	Requirement
SIZE	
Platform Surface	24” x 24”
MOTION	
Degrees of Freedom	2 (Pitch and Roll)
Maximum Rotation	±30°
Angular Velocity	30° per second
Maximum Sea State	5
LOAD	
Center of Mass	12”
Load Weight	50 Pounds
CONTROLS	
Interface	Ethernet
Data Type	UDP
COST	
Budget	$15,000

Table 1. Exact Specifications for Motion Table

Results - Hardware

- All table components have been selected
- Testing on individual components completed
- Fabrication of table completed
- Testing of total table functionality has begun

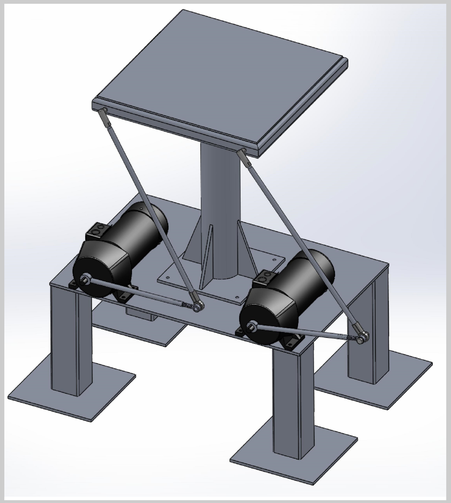

Figure 2. Final Motion Table Design

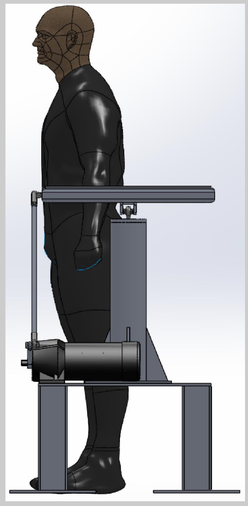

Figure 3. Table Scale

Results - Software

- Table design and requirements have been assessed using Motion Platform Designer software
- Table has been fully modeled and verified in SolidWorks
- Basic Ethernet communication with Arduino completed
- Basic control algorithms have been implemented

Figure 4. Motor, Power Supply, and Driver Configuration

Conclusions

- The table has been fully designed and built.
- Testing of table performance has begun
- Basic control algorithms are being improved

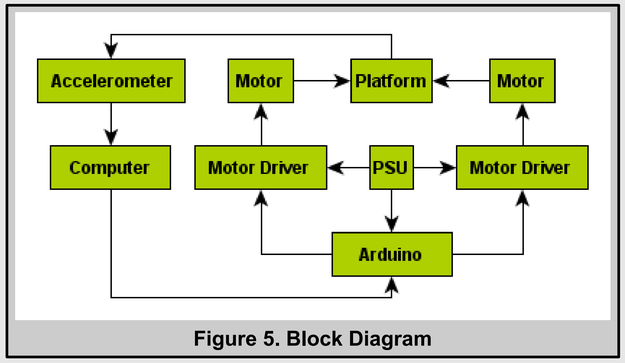

Figure 5. Block Diagram

Future Work

- Begin advanced table control & motion profiles
- Finish testing table performance
- Table testing with weighted load
- Perform design analysis
- Finalize project and complete design review with sponsor
- Final testing with mounted antenna

Design Team: Derrick Duran, Kevin Ryan, Juan Lopez

Acknowledgments

Michael T. Pace (Raytheon-Ktech Sponsor)
Chris Patscheck (Raytheon-Ktech Sponsor)
Aaron S. Downie (Raytheon-Ktech Drafter)
Dr. Kevin Wedeward (Academic Advisor)
Dr. Robert Bond (Senior Design Professor)

References

Figure 1 – Motion Platform Designer – fly.elise-ng.net
Figure 2,3 – Solid Works Model – Aaron S. Downie