HyperXite 9

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INTRODUCTION

The HyperXite electronics subsystems of Powers and Controls are dedicated to creating an electrical and control system for our Hyperloop Pod. Powers is developing a three-phase variable frequency drive (VFD), specifically tailored to power the Linear Induction Motor (LIM). Additionally, Powers is designing all power electronic circuitry for the pod. Concurrently, Controls is developing a finite state machine, a graphical user interface, and all corresponding control software for our various sensors and components.

OBJECTIVE

We aim to design a pod that is environmentally friendly, cost-effective, and safe for travelers. While there are other forms of transportation that each have their pros and cons, there generally exist tradeoffs between environmental impact, cost, and safety. We at HyperXite believe that our pod can reach beyond this status quo to achieve all three of these goals. We envision a pod that not only meets but exceeds expectations, harmonizing environmental responsibility, affordability, and passenger safety to redefine the future of sustainable transportation.

COMPONENTS

1. Battery Management System
2. Buck Converter
3. Finite State Machine
4. Graphical User Interface
5. High & Low Voltage Battery Systems
6. HyperXite GPT - Generative AI Bot
7. LiDAR Camera System
8. Linear Induction Motor
9. VFD PCB
10. Raspberry Pi 4
11. Raspberry Pi Pico
12. Rotary Encoder
13. Variable Frequency Drive
14. Lithium Polymer Batteries

REFERENCES

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RESULTS

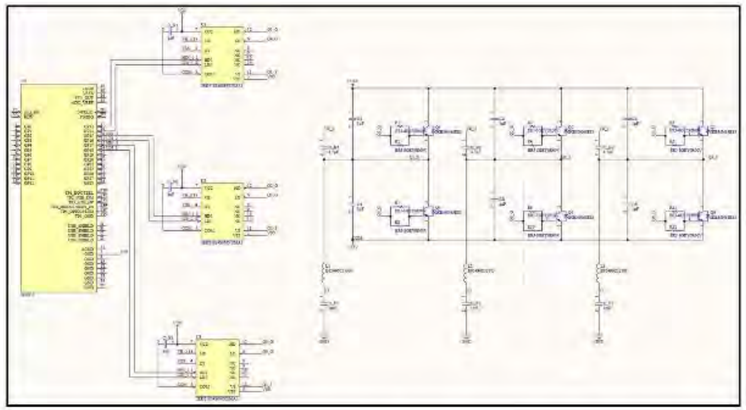

Figure 1: Altium schematic for three-phase VFD

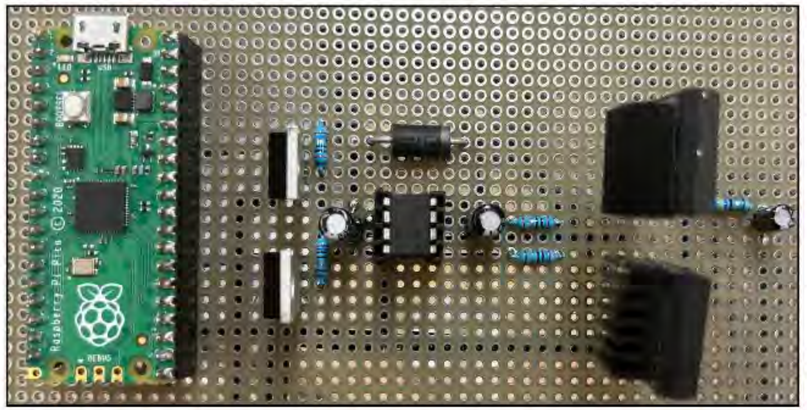

Figure 2: Single-Phase VFD Protoboard

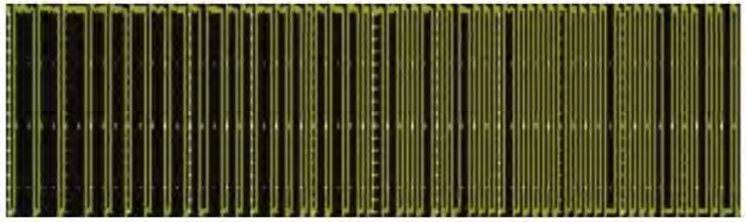

Figure 3: Waveform generated by the SPDM code implemented in C++ and tested using Raspberry Pi Pico

Figure 4: Mini Linear Induction Motor

HIGHLIGHTS

1. **LTSpice simulation for three-phase VFD:** crucial for understanding the behavior of our system and refining our design approach.
2. **SPDM code:** this C++ code is integrated with propulsion calculations for our LIM, forming the backbone of our control system.
3. **Single-phase VFD protoboard testing:** confirmed the practical implementation of our design, and resulted in a redesign of our first iteration.
4. **Altium VFD schematic:** capable of generating a +/- 176V 20A RMS sine wave of any frequency within 0-37 Hz
5. **Mini-LIM:** demonstrated the functionality of our propulsion design, while we await the development of our full-scale LIM.
6. **Development of AI chatbot:** this model allows users to interactively learn about our pod and project using OpenAI's GPT-3.5 Turbo model.
7. **Integration of LiDAR camera:** incorporating a LiDAR camera with our braking system, enhancing safety and precision.
8. **Creation of graphical user interface (GUI):** provides intuitive control and monitoring capabilities, ensuring efficient operation of the pod.

ACKNOWLEDGEMENTS

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