Team Cambridge Technology: Bestrack#1

Itemized Remaining Technical Challenges

1. **Milestone#1:** Develop More Mature Motion Profiling Mathematics
   1.1. Research current methodologies for controlled acceleration profiling. **(Evan)**
   1.2. Define rapid math-based algorithms for generating velocity slopes based on smooth acceleration parameters. **(Evan)**
   1.3. Design an algorithm to translate the generated trajectory profiles into pulse-count and pulse-period pairs, to eventually be delivered to the FPGA fabric. **(Evan)**
   1.4. Fully test and adjust the above theoretical basis for motion profiling in a controlled environment with the linear slide. **(Joint)**

2. **Milestone#2:** Implement High-Level Motor Control and Define API
   2.1. Research and test data transfer/delivery from bare-metal core to FPGA modules (AXI communication). **(Joint)**
   2.2. Modify FPGA hardware to receive pulse-count and pulse-period pairs and convert them into dynamic step-and-direction signals for propagation to the stepper motor. **(Evan)**
   2.3. Implement the trajectory profiling algorithms of Milestone#1. **(Alec)**
   2.4. Design basic test codes to ensure the validity and effectiveness of the high level control. **(Alec)**

3. **Milestone#3:** Fully Integrate Into SMC Architecture
   3.1. Working with the Technical Directors, establish a better understanding of how to interface with the Linux core, and how our work will be best integrated. **(Joint)**
   3.2. Develop device driver code to activate the motion control algorithms and actuate the step-and-direction logic. **(Alec)**
   3.3. Based on the feedback from 3.1, follow through with porting our code and driving software into the full-scale system. **(Alec)**
   3.4. Test that our code is still operational, even under more complex or non ideal situations. **(Evan)**

4. **Milestone#4:** Finalize Demonstration to Exercise the API
   4.1. Working with the Technical Directors and their equipment, define an exhaustive test application in abstract terms to demonstrate the robustness of our work. **(Joint)**
   4.2. Implement the above application and confirm successful/desirable operation with the Technical Directors. **(Alec)**
   4.3. Finalize documentation and ensure our code is well defined, organized, and easily passed off to any engineer. **(Joint)**

1.1. **Project Execution Roadmap**

Week	Dates Spring 2023	Items to be Worked on	Anticipated Milestone Completion
1	1/24 - 1/30	1.1, 2.1	
2	1/31 - 2/06	1.2, 1.3, 2.1, 2.2	
3	2/07 - 2/13	1.2, 1.3, 2.3, 2.4	
4	2/14 - 2/20	1.4, 2.4	Milestone#2
5	2/21 - 2/27	1.4	
6	2/28- 3/06	1.4, 3.1	Milestone#1
7	3/07 - 3/12	3.1, 3.2, 3.3	
8	Spring Break		
9	3/21 - 3/27	3.2, 3.3, 3.4	
10	3/28 - 4/03	3.4, 4.1	Milestone#3
11	4/04 - 4/10	4.2	
12	4/11 - 4/16	4.3	Milestone#4

Add sections for further technical details, questions etc. (see template starting on next Page)

Further Details on Key Technical Accomplishments and RESULTS: (Identify Designer)

Schedule Assessment: (If behind schedule, indicate plan to get back on schedule)

Important Questions for Technical Directors