BFMC 2025 : Status Report 1
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Overview of Project Approach

As our team has previously participated in the competition, our approach to the project this year is one that builds upon what has been achieved previously and that is focused on addressing the shortcomings of the previous year. With this goal in mind, our team had a meeting early in September to determine what the approach for this year would be. Having reviewed both what went right and what went wrong, we identified our strengths and weaknesses and planned according to those observations. Our main takeaway was that there was a lack of integration testing prior to the competition. Our software was very good at performing in the simulator, our hardware had the capabilities to run our algorithms, but integration of the two together had proved to be a task that we underestimated. This year, integration will be our focus.

Current Phase

Given our project approach, the very first phase will be integration of the algorithms from last year with this year's new car. This phase was accomplished successfully over the course of the fall and since the receipt of the car, as is demonstrated in the accompanying media file. We were able to build a track from scratch on which to run our car, and to have an integrated testing run. This enabled us to identify the shortcomings of our current integration. The next phase will be to fix these shortcomings, which are mainly on the hardware calibration side.

Task Status - Overview

In terms of our set goals and planning, the status of the tasks is acceptable and we are on track with respect to the plan. The tasks with the highest priority were accomplished in the allotted time and this enabled us to have a successful integration run : track fabrication, obtaining data from the IMU sensor, launching the Intel RealSense reliably, and integration testing. The full status of the tasks can be found in the attached task tracker table export.

Blocking Points and Encountered Issues

One task that has taken longer than expected is the retrieval of IMU data from the intel RealSense camera. Computing the yaw, which is required for our car's orientation, has proven more difficult as current approaches yield a very unstable value which fluctuates. Another encountered issue had to do with communication between the new STM32 board we are using and the motor/servo PWM. When we were powering the board through a source other than the powerboard on the car, the PWM would not work and we spent a lot of time troubleshooting. The issue was finally resolved by connecting the STM to the same ground as the motor and servo. Finally, serial communication between the jetson and the STM32 has been giving us

corrupt values when using the new IMU sensor board. We have therefore had to resort to using the old IMU sensor for the time being.

Next Steps

Our next steps will necessarily follow from the observations made during our first integration test. On this test, we noticed a considerable offset between the expected distance travelled and the actual distance on the track. This had been noticed during our steering calibration test the previous week, where there was a 1 to 5 degree offset between expected and actual steering values. While a provisionary software fix had been attempted during the integration testing, the results proved that it was not sufficient and that an entire hardware recalibration was necessary. This is especially important given the nature of our control algorithm which heavily relies on dead reckoning. Therefore, the following month will focus heavily on calibration of both steering and speed before attempting another integration test. On the software side, there will be a need to adapt the dashboard so that there is no longer such a significant delay between what is shown and the actual surroundings of the car.