Students should complete, electronically sign, and upload this form on Canvas. The capstone supervisor will then use Canvas to comment, and note a grade of S(atisfactory) or U(nsatisfactory). The capstone coordinator will collate and submit the S/U grades to registry. If a student’s progress is Unsatisfactory, s/he must submit a work plan for the supervisor’s approval, prior to the end of Week 2 of Semester 2. Only with this approval, may the student register for the Semester 2 capstone module. A grade of ‘IP’ will then be entered for Semester 1.

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| Capstone Project Title: Real-time Filtering for Multi-sensory SLAM Benchmarking | |
| Student Name: Jianglong LIAO | Student ID: E0023009 / A0152453L |
| Supervisor Name: Prof. Bruno Bodin | Major: MCS |

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| **Student Self-Assessment** |
| Which goals in your capstone proposal have been achieved thus far? Are you on track with your timeline? Which skills have you acquired or practiced? What problems, if any, have you encountered? |
| For this semester, I have been devoted to the first goal of my capstone, which is to implement the filtering system inside SLAMBench. In order to implement the filtering system, there are two parts I need to do: first, I need to understand the architecture of SLAM Benchmarking piece by piece and devise an architecture of the filtering system, and second, I need to implement the filtering system within the SLAMBench framework. Respectively, I have spent first half of the semester on the first part, and the rest on the second part. The first part is completed and for the second part, I have not entirely finished implementing the filtering system, Yet the progress is on track with respect to what was planned to finish before the second semester, which is to have a preliminary implementation of a simple filtering system.  The skills I have practiced so far include technical skills such as software engineering literature review and programming, as well as soft skills such as incremental problem solving and time management. In the first few weeks, reviewing literatures with regards to SLAM and software engineering papers were challenging. With limited experiences in SLAM algorithms and software architecture, I need to study them and fill in the gap of knowledge on the fly. Taking reading notes and going through the software architecture while documenting all functions have been extremely helpful in understanding materials. Translating architecture into codes while keeping the integrity of the original benchmarking framework was another challenge I encounters. Although having programmed extensively in previous courses, C++ is a relatively unfamiliar programming language. Hence, I have to pick up the language from external, online courses, and consult Professor Bodin frequently with regards to the programming semantics. I have improved my programming in C++ and my architectural thinking throughout the semester.  In terms of soft skills, problem-solving has been my prime skill I have improved upon this semester. Initially, I have been struggling to refactor the benchmarking architecture due to the size of the project and my unfamiliarity with C++. However, to understand the project architecture, I have broken the architecture into small pieces and attempted to digest one by one. Although the time taken was much longer than I expected, with a solid understanding of the framework, I was finally able to implement my own filtering system in the SLAMBench much faster. Therefore, throughout this semester, I have learned to incrementally gain understanding before I actually start solving the problem.  A more general problem I encountered and foresee to persist is debugging a complex, open-source project. Throughout the process, I have been working closely with Professor Bodin and Research Assistant Jaime to seek help whenever I encounter difficulties. I am grateful for the assistance I have received this semester. |
| What goals will you tackle next semester? If you have faced challenges in Semester 1, how do you hope to overcome these in Semester 2? What academic skills do you aim to cultivate? |
| The next semester will be devoted to the second goal of my capstone, which is to further develop the flow filtering system and experiment it with different data sets and SLAM algorithms. The challenges I faced in Semester 1 can be overcomed by incremental development, trials and errors, and continuing thinking in terms of whole SLAMBench architecture. Besides, I aim to cultivate the ability to solve architecture design and programming problem no just by receiving guidance and discussion, but also through critical, systematic searching for solutions on my own. I have done some work in this aspect this semester. Since for the next semester, I will be developing a more complex filtering system for more general usage, I hope to gain more experience in designing architecture and programming on my own during Semester 2. |

Student’s Signature : Jianglong LIAO Date: 2019/11/14