Hochschule
Bonn-Rhein-Sieg
University of Applied Sciences

b-it Bonn-Aachen International Center for Information Technology

SLAM with Factor Graphs

April 24, 2022

Ravisankar Selvaraju
Samuel Salazar
Selvakumar Nachimuthu
Tharun Sethuraman

Introduction

Project description: Implementing Simulataneous Localization and Mapping (SLAM) using Factor Graphs

Project Goals:

- Creating a scientific library for factor graphs in GNU - GSL
- Practical implementation of the developed library on a simple toy problem

User Stories

User story-01

Priority: High	**US01**	**Estimation: 2 week**
Requirement	As a developer,	
	I want to create factor graphs using GTSAM	
	so that I can use those factor graph in the implementation of SLAM	
Acceptance criteria	The created factor graph should be able to implement SLAM	

User Stories

User story-02

Priority: High	**US02**	**Estimation: 2 week**
Requirement	As a developer,	
	I want to build a custom library using GNU-GSL to generate factor graph	
	So that I can have my custom factor graph library to solve future SLAM related problems	
Acceptance criteria	The library should generate factor graphs that can be used to solve SLAM related problems	

User Stories

User story-03

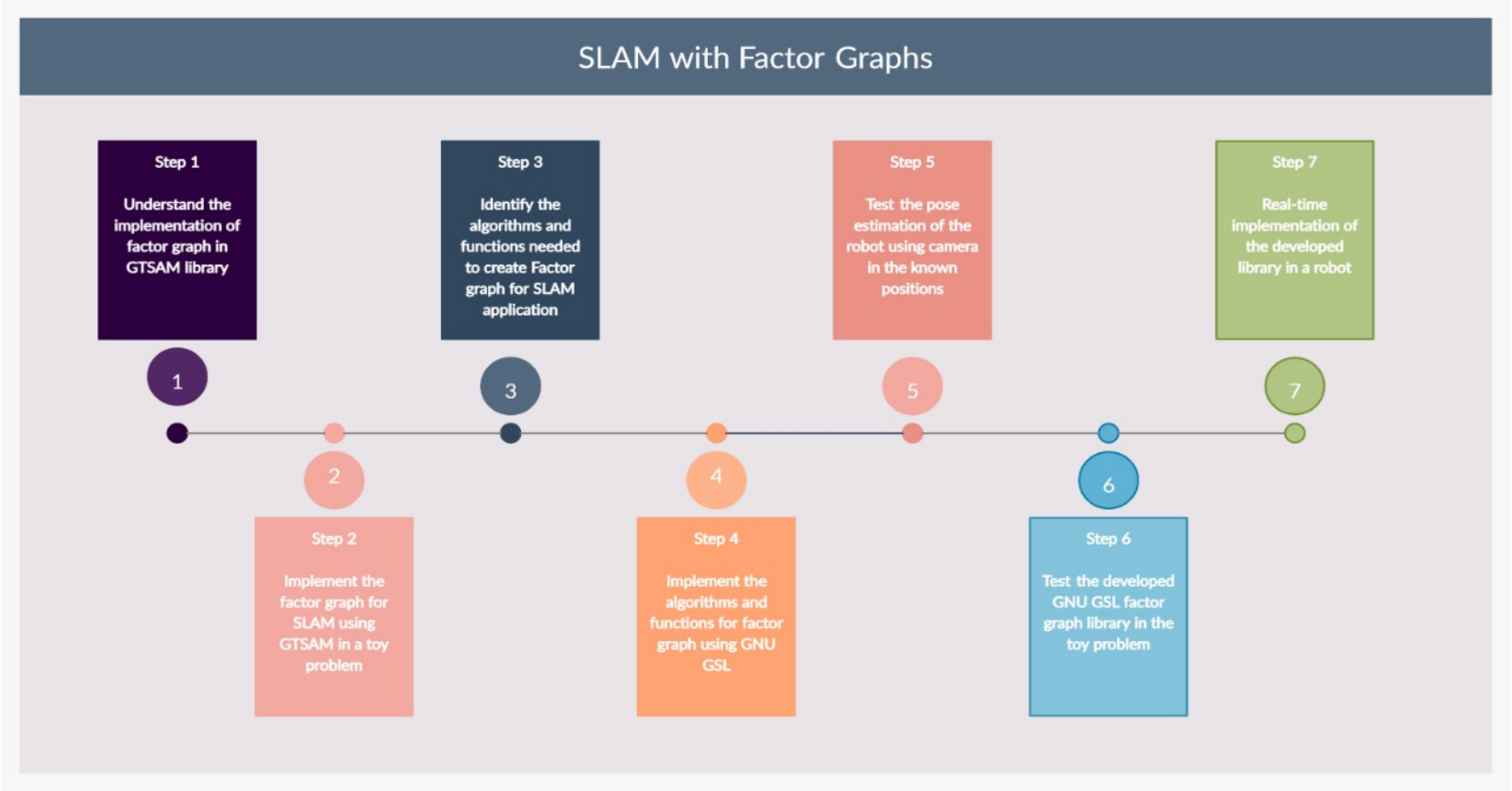
Priority: High	**US03**	**Estimation: 2 week**
Requirement	As a developer,	
	I want to develop a message-passing algorithm	
	So that we can infer information from those factors between the nodes	
Acceptance criteria	The algorithm should be implemented in a way that it should update the factors from the observations	

User Stories

User story-04

Priority: High	**US04**	**Estimation: 1 week**
Requirement	As a developer,	
	I want to build a library with functionalities for landmark based localization	
	So that I can localize the robot based on the aruco markers	
Acceptance criteria	Given that the position of the aruco markers are known, the implemented functionality should be able to perceive the aruco markers with the help of camera and estimate the position of the robot	

Process Workflow



Software development methodology

SCRUM process

- Goal/backlog setting for next sprint
- Retrospection of the past sprint
- Sprint Meetings
  - Meeting among developers to discuss what has been done/ongoing (10min)
  - Sprint meetings every three weeks with scrum master/coach
    1. April 25
    2. May 16
    3. June 7
    4. June 27

Means of communication

- **Github:** Task assigning, maintaining to-do lists, documentation of meetings
- **Webex/offline:** For conducting sprint meetings and technical discussions

Tools and Technologies

Languages

- C, C++
- Python

Libraries

- GTSAM
- GNU - GSL