Semantic Maps

Proposal

Storage Format

Create a format similar to specifications of OSM or use a modified version of OSM itself. The reason to go with OSM is since its a well know format and has a lot of existing tools for it which can be used.

OSM specification is quite modular in terms of adding new functionality in the future.

I/O Library

The shared library would allow reading the XML and interpreting the various data elements. This would be useful in CostmapFilter plugins. As well as for external editors etc.

GUI Editor / Visualization

For a GUI editor there are three possibilities:

1. Rviz
   Building an editor using Rviz plugins would allow for a single tool for editing as well as visualization. Rviz is already pre-installed with ROS and is familiar to all users.
2. Web-Based
   Building something similar to OSM Editor would allow for rapid development since a lot of libraries as tools exist for similar tasks. Another benefit would be since it is web-based it is easily accessible.
3. Qt Based
   This would require significantly more time but would
   be completely independent.

RViz and Qt-based editor implementations can harness the power of shared library used for interpreting the semantic maps, whereas the Web-based editor needs to built upon open-source libraries.

CostmapFilter

As suggested in #1263 there would be a CostmapFilter Layer and which would have multiple plugins like KeepoutLayer & SlowdownLayer for starters.

These plugins would have to implement functions to interpret the semantic map and then take action on it.

Map Server

The map server could serve as a central server to load the map into a graph-based representation as well as serve queries and modify the map.
Eg. It could fetch info like is object ABC inside room XYZ.

It could be used to dynamically change map information such as which areas are blocked off or change the speed set in various zones.

Roadmap

- [ ] Discuss and decide on a specification for representing the maps as well as the basic tags and types to use initially.
- [ ] Build an I/O interface to read the format

- [ ] Build CostmapFilter base plugin
- [ ] Build sample plugins like KeepoutLayer & SlowdownLayer
- [ ] Design and develop GUI Editor

Future Work

- Read the map and make a graph-based representation so that it can be dynamically modified and queried.
- Add support for defining predefined paths i.e. topological navigation
- Add support for multi-story maps
- Add support for sub-maps and map-merging
- Editing / creating semantic maps on the fly.

Relevant Issues

- Semantic Map: #401, #404, #547, #1263, #1595, #1522, #1590
- Sub-Maps: #548, #549
- Multi-Story: #1266