A Framework for Bearing-Only Sparse Semantic Self-Localization for Visually Impaired People

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Background

Standard localization systems generally use low level information as input, which has to be combined with semantic information by extra steps to be understandable for visually impaired people.

Objectives

Obtaining 2D pose of a person on a 2D map directly without a need for extra calibration.

Methods

Define a sensor model to directly work with semantic information.

The sensor model uses bearing angle to the object center and semantics.

Obtain semantic information from spherical camera to localize the user.

A spherical camera is carried by the user to obtain information with its large FOV.

Annotated 2D map

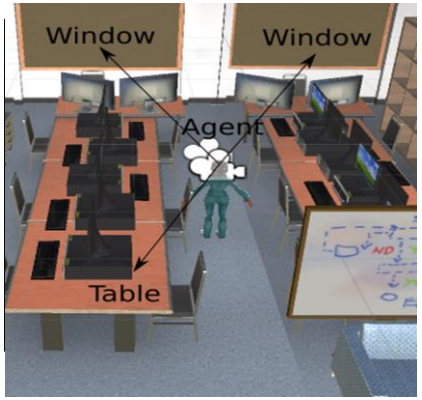
A 2D map with selected object classes annotated on it without an identification.

Localization by using a semantic Monte Carlo Localization.

Use information from spherical camera, sensor model and an annotated 2D map.

Results and Discussions

2D pose of the user on an annotated 2D map was obtained successful under different conditions (Fig 2: missing detections, Fig 3: blocked views) and different FOVs (180, 270, 360 deg) by directly using semantics and bearing angle in the sensor model without extra calibrations.



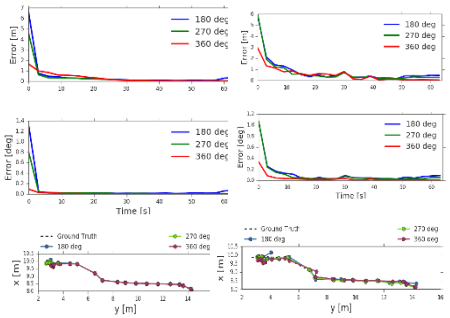


Fig 1 Fig 2

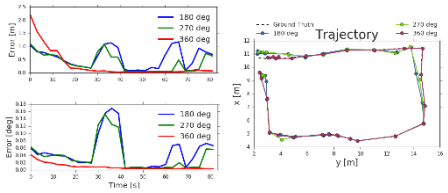


Fig 3

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