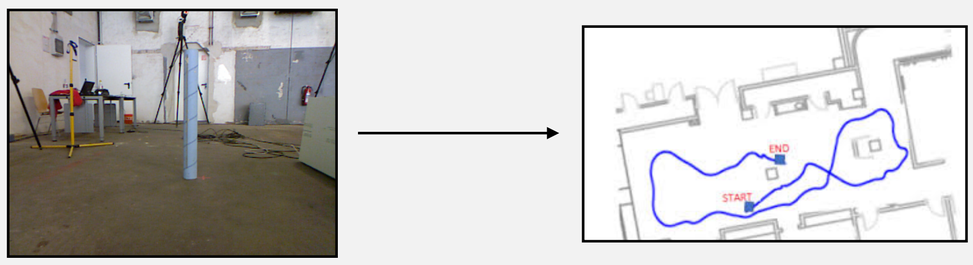
Simultaneous Localization and Mapping of a 3D Space into a 2D Map

Yin Wang, Fanzhong Kong, Rahul Bejarano, Luke Cohen

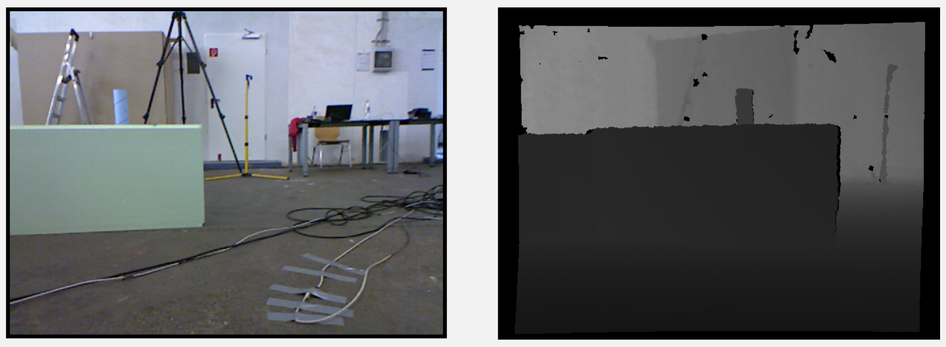
Goal: Video to 2D Map



Motivation: Our group was interested in implementing an algorithm that would allow a robot using an RGB-D camera to have the ability to map an environment while simultaneously localizing itself within the environment.

We implemented an Extended Kalman Filter version of SLAM that allowed us to track the movement of the robot within the environment with some precision.

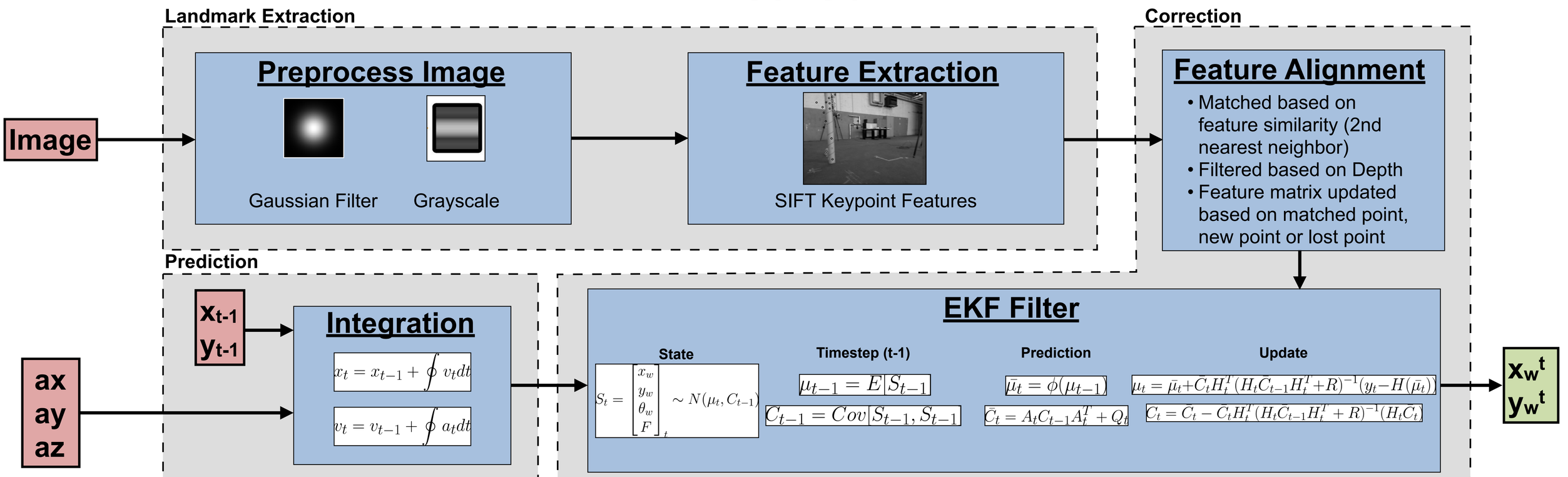
Data:



```
# accelerometer data
# file: 'rgbd_dataset_freiburg1_rpy.bag'
# timestamp ax ay az
1305031225.727159 0.682514 7.818977 -5.603800
```

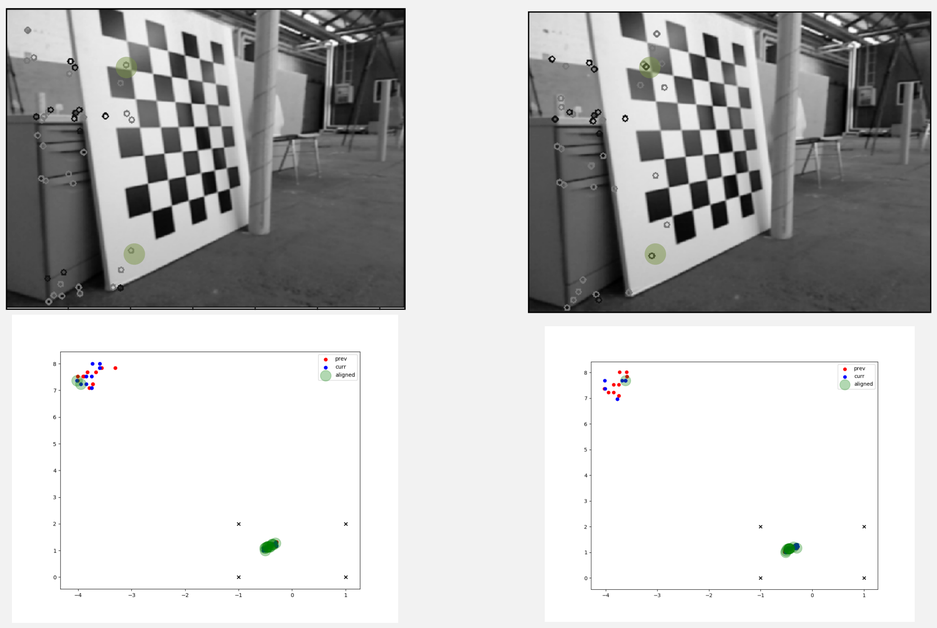
Data: Freiburg2_pioneer_SLAM
Contents: 4000 - 6000 consecutive RGB image
4000 - 6000 consecutive Depth images
Timestamped IMU Data
Source: Computer Vision Group, Technical

Method:

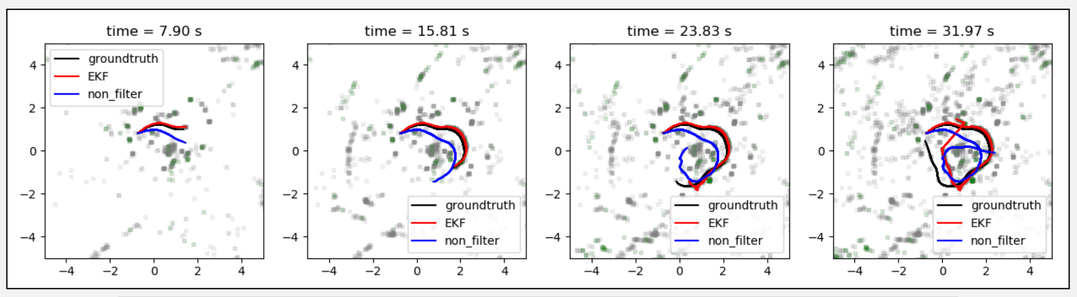


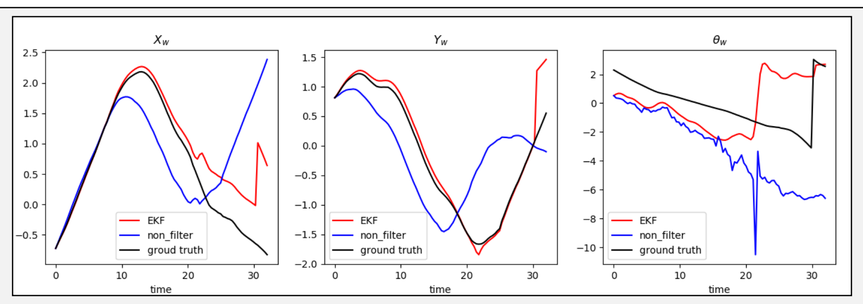
Results

Feature Extraction



Final Mapping





Note: EKF is only first-order accuracy, and is efficient but essentially less robust than graph-based optimization method. Due to this, we found that rapid changes to the camera caused our algorithm to become very inaccurate.