MTRN4010.2023

Data structure for datasets used in Project 1

The Datasets we use in Project 1 are offered via Matlab files. A dataset is a collection of measurements from different sensors. Each measurement is composed by its data (specific to the sensor) and a timestamp (time at which the measurement was taken).

A dataset is provided via a Matlab file that contains just one variable, called **data**, which is an instance of a relatively complex structure whose more relevant fields are:

n: number of sensors' events in this experiment/trip.

table: Table of sensors events, chronologically ordered. It is a matrix of 3 rows by **n** columns, being **n** the number of events in the table. This matrix is class int32. Each column of this matrix describes an event. An event is composed by 3 parts: timestamp, sensor type and information to read the measurement's data.

vw: Is a matrix which contains all the Dead-Reckoning sensors' measurements (in our project those are speed and gyro's measurements). Matrix data.**vw** is class "single" (floating point single precision)

Speeds are expressed in m/s and the gyros' measurements in radians/second.

scans: is a matrix, class **uint16**. d**ata.scans** contains a list of LiDAR measurements, i.e. scans (from LiDAR#1), each of them associated to a LiDAR event. Each column of this matrix contains a full LiDAR scan (301 ranges, for the model and mode of operation used in our project).

Scans2: is a matrix that contains a list of LidAR measurements (from LiDAR#2). Its size is identical to that of LiDAR#1, as both sensors are identical in our project.

pose0: is the initial pose of the platform, for the trip performed by the platform, which was recorded and saved in the dataset contained in the variable data.

verify: Is a structure that contains data for validating your results. A ground truth trajectory is offered by **data.verify.PoseL** with contain frequent samples of the actual trajectory of the platform (i.e., platform's poses at the times of the LiDAR events). This trajectory is to be used as ground truth, for validating some of your results.

LidarsCfg: is a structure which contains information about how LiDARs are installed on the platform (such as the senso's position and orientation in the car's coordinate frame), Field of View (FoV) and angular resolution of each LiDARs. **data.LidarsCfg** has multiple fields, each of them dedicated to a specific LiDAR unit. See the provided example program for details about reading that information.

Context: is a structure that describes the context of operation, for that trip/experiment. It describes certain static objects present in the area of operation. Those objects are walls and poles.

data.Context.Landmarks : The positions of a list of known landmarks

data.Context.Walls: the walls, present in the context of operation.

In the provided example program, we use those fields, for plotting the context of operation in the global coordinate frame.

The example program "**ExampleUsingDataProject1_2023b.m**" is a good way for understanding how to read the specific component of a dataset.

Question about this document: ask the lecturer, via Moodle or Teams, or by email (j.guivant@unsw.edu,.au). Or ask the demonstrators in your lab-tut session.