Software Engineering Project:

GUI

MAGMA

Professor: Dr. Yohan Fougerolle, Dr. Cansen Jiang, Dr. David Strubel

January 7, 2018

I. MAIN WINDOW

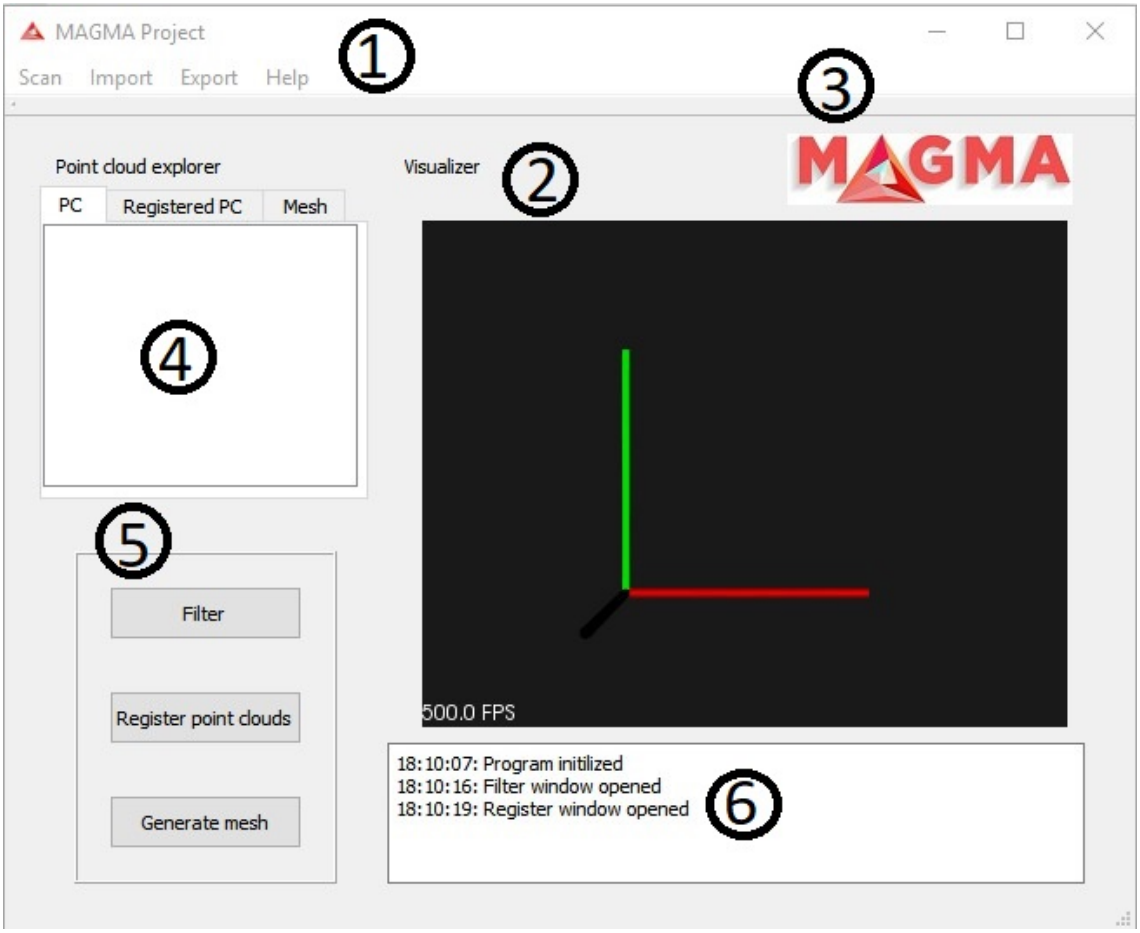

FIG. 1: GUI main window design

The GUI Main Window is organized as follow:

1. **Upper Tools**: Allows the user scan,import,export,help and type. They can be divided into subsections.

   (a) **Scan**: Scan section includes:

      i. **New scan**: To capture new scan.

      ii. **Type Here**:

      iii. **Add Seperator**:

(b) **Import**: Import section includes:

i. **Import point clouds**: Importing point clouds.

ii. **Import registered PC** : To import registered point cloud.

iii. **Type Here**

iv. **Add Seperator**

(c) **Export**:This section includes:

i. **Export point clouds**: Exporting point clouds.

ii. **Export registered PC**: To export registered point cloud.

iii. **Type Here**:

iv. **Add Seperator**:

(d) **Help**: To find solution of problems.

i. **User manual**

ii. **About**

iii. **Type Here**:

iv. **Add Seperator**:

(e) **Type Here**:

2. **Visualizer**:

3. **MAGMA Logo**: Project logo.

4. **Point Cloud Explorer**

(a) **PC**: Point Cloud

(b) **Register PC**: Registering point cloud.

(c) **Mesh**: Meshing point clouds.

5. **Register Frame**:

(a) **Filter**: To do filtering operations.

(b) **Register Point Clouds**: Registerring point clouds.

(c) **Generate Mesh**: Generating mesh.

6. **Logger Text Edit**:

II. FILTERING

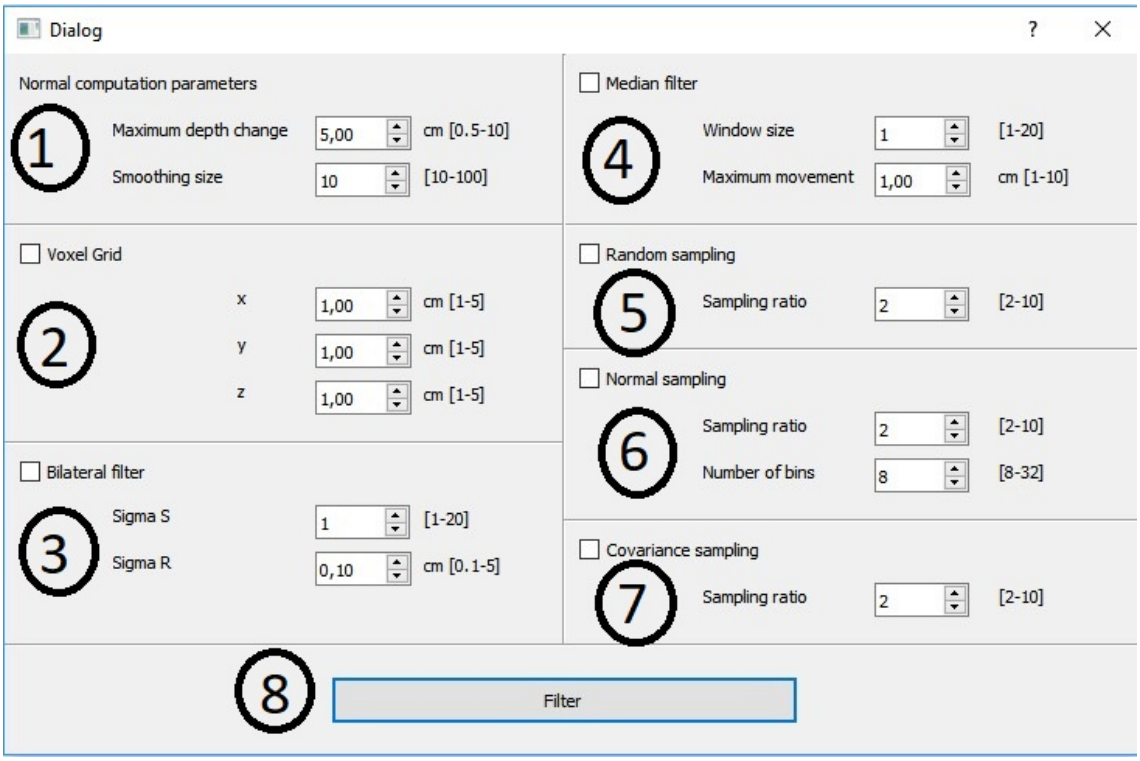

FIG. 2: GUI filtering window design

The GUI Filtering is organized as follows :

1. **Normal computation parameters**:It is used for input point cloud in the space of normal directions computed at every point.

   (a) **Maximum depth change**: The depth change threshold for computing object borders based on depth changes.

   (b) **Smoothing size**: The factor which influences the size of the area used to smooth normals .

2. **Voxel Grid**: It is used to downsample the given point cloud.
    (a) **x**: Size of filter.
    (b) **y**: Size of filter.
    (c) **z**: Size of filter.
3. **Biletarel Filter**: It is used for smoothing depth information in organized point clouds.
    (a) **Sigma S**: The size of the Gaussian bilateral filter window to use.
    (b) **Sigma R**: The standard deviation of the Gaussian for the intensity difference.
4. **Median Filter**: It is implementation of the median filter.
    (a) **Window Size**: Setting the window size of the filter.
    (b) **Maximum Movement**: Maximum value a dexel is allowed to move during filtering.
5. **Random Sampling**: Random sampling with uniform probability.
    (a) **Sampling Ratio**: The ratio of sample size to total size.
6. **Normal Sampling**:
    (a) **Sampling Ratio**: The ratio of sample size to total size.
    (b) **Number of Bins**: Number of bins that is used.
7. **Covariance Sampling**: It selects the points such that the resulting cloud is as stable as possible for being registered (against a copy of itself) with ICP.
    (a) **Sampling Ratio**: The ratio of sample size to total size.
8. **Filter**: It is used to apply selected filter.

III. REGISTRATION

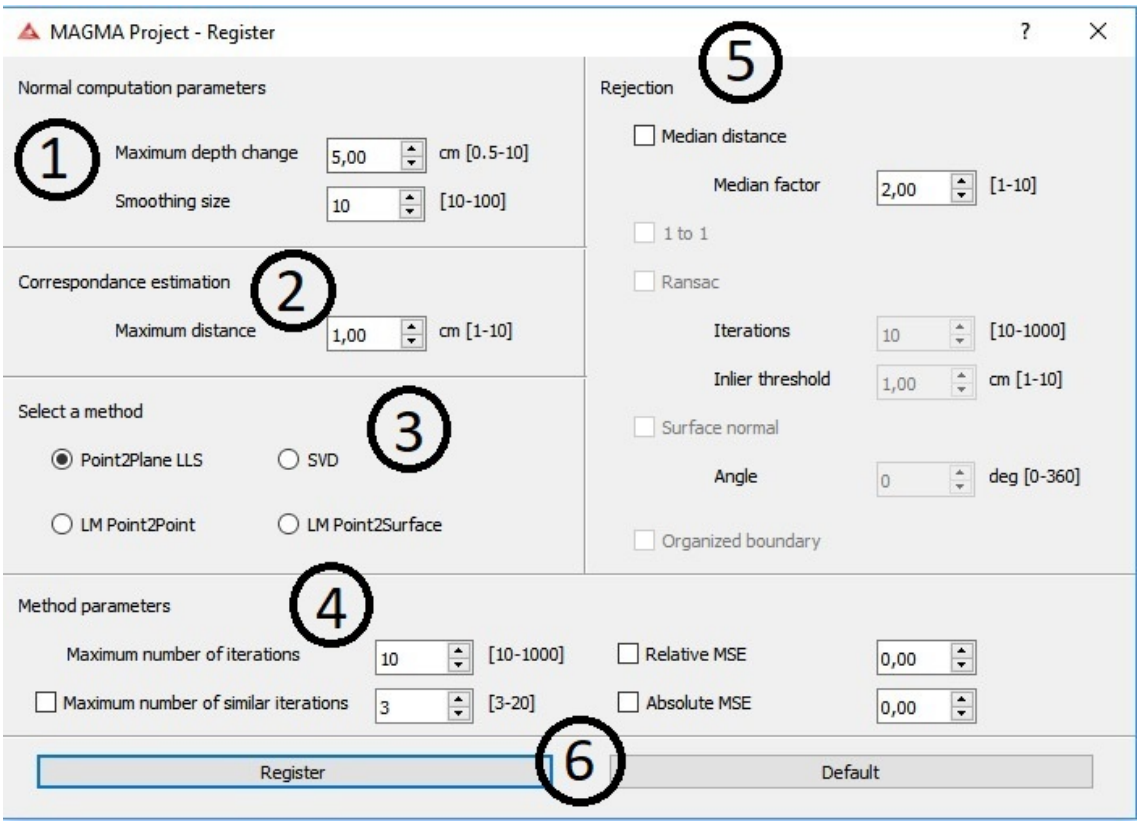

FIG. 3: GUI registration window design

The GUI Filtering is organized as follows :

1. **Normal computation parameters**:

   (a) **Maximum depth change**: The depth change threshold for computing object borders based on depth changes.

   (b) **Smoothing size**: The factor which influences the size of the area used to smooth normals .

2. **Correspondance estimation**:

   (a) **Maximum distance**:

3. **Select a method**: One method of 4 different algorithms is chosen as follows:
   (a) **Point2Plane LLS**: Point to plane linear least square method.
   (b) **SVD**: Singular value decomposition method.
   (c) **LM Point2Point**: Levenberg Marquardt point to point method.
   (d) **LM Point2Surface**: Levenberg Marquardt point to surface method.
4. **Method Parameters**: For selected method, the below parameters are tuned.
   (a) **Maximum number of iterations**: Number of maximum iteration is chosen.
   (b) **Maximum number of similar iterations**: Number of similar iteration is chosen.
   (c) **Relative MSE**: Relative mean square error.
   (d) **Absolute MSE**: Absolute mean square error.
5. **Rejection**: To reject, following parameters are set:
   (a) **Median distance**: Median distance between correspondences.
      i. **Median factor**: Median factor between corresopondences
   (b) **1 to 1**:
   (c) **Ransac**: Random sample consensus (RANSAC) is an iterative method to estimate parameters of a mathematical model from a set of observed data that contains outliers, when outliers are to be accorded no influence on the values of the estimates.
      i. **Iterations**: Number of iterations.
      ii. **Inlier threshold**: Ransac inlier threshold value.
   (d) **Surface normal**:To a surface at a point P is a vector that is perpendicular to the tangent plane to that surface at P.
      i. **Angle**: Angle of surface normal. (In degrees)
   (e) **Organized boundary**: Boundaries are chosen.
6. **Register and Default**: When you click register , program works according to your tuned parameters. Default option gives the result according to default values.