# Camera Based 2D Feature Tracking Mid -Term Report

## Data Buffer

### MP.1 Data Buffer Optimization

Satisfied by using the RingBuffer class (RingBuffer.h) instead of a vector of DataFrame. The RingBuffer class fills a vector up to the limit of ‘dataBufferSize’. Then each new addition is added at the end of the vector after existing members have been shuffled down by 1. The class could be made more efficient by the use of an ‘inptr’ and its own iterator (so the existing member shuffle is not required when a new image is added).

## KeyPoints

### MP.2 Keypoint Detection

Implemented the ‘detKeypointsHarris’ fn for the Harris keypoint detector and the ‘detKeypointsModern’ for the FAST, BRISK, ORB, AKAZE, FREAK and SIFT detectors, selectable using the relevant detectorType string from the parent fn. Note: Although the code builds with the FREAK detector implementation, running this detector results in a ‘Feature Not Implemented’ exception from opencv and a core dump.

### MP.3 Keypoint Removal

Implemented a keypoint removal filter based upon the rectangle supplied. (line 115-128 in MidTermProject\_Camera\_Student.cpp. Note: Tried a narrower rectangle (550, 180, 150, 150) to remove more points just outside the vehicle boundary.

## Descriptors

### MP.4 Keypoint Descriptors

Implemented the student part of the ‘descKeypoints’ function. Added descriptor extractors for BRIEF, ORB, FREAK, AKAZE and SIFT, selectable by the appropriate descriptorType string.

### MP.5 Descriptor Matching

Implemented the FLANN matcher (lines 21 to 29 in matchDescriptors) and the knn selection (lines 38 to 53 in matchDescriptors), both selectable by the appropriate selection strings.

### MP.6 Descriptor Distance Ratio

Added the knn descriptor matching ratio filter as implemented in the preceding lesson segment.

## Performance

### MP.7 Performance Evaluation 1

No Of KeyPoints found

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Image # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|  |  |  |  |  |  |  |  |  |  |  |
| HARRIS | 34 | 29 | 40 | 37 | 50 | 151 | 26 | 67 | 59 | 87 |
| FAST | 141 | 143 | 140 | 149 | 139 | 139 | 153 | 142 | 131 | 135 |
| BRISK | 254 | 274 | 276 | 275 | 293 | 275 | 289 | 268 | 258 | 249 |
| ORB | 87 | 101 | 105 | 110 | 106 | 121 | 128 | 120 | 117 | 117 |
| AKAZE | 162 | 157 | 159 | 154 | 162 | 163 | 173 | 175 | 175 | 175 |
| SIFT | 137 | 131 | 121 | 135 | 134 | 139 | 136 | 147 | 156 | 135 |