1 Method

This section describes the method used to detect the canal shoreline using both brightness constancy assumption and the dynamic motion of water.

1.1 Features Tracking and Initialization

A set amount of k trackers is initially initialized using the Shi-Tomasi corner detection algorithm that detects good features to track. Due to the strong corners presented in the canal shorelines, several features will be initiated on the shoreline. Then a pyramidal implementation of Lucas-Kanade optical flow algorithm is used to displace the tracker across the subsequent n frames. Due to the brightness constancy assumption of optical flow, trackers on water would be more likely to lost, leaving the remaining trackers on the canals.

1.2 Entropy Calculation

The entropy calculations follows the one proposed by Pedro Santana. The equation of entropy is defined as:

$$p \equiv (x_0, \ldots, x_n) \tag{1}$$

$$L = \sum_{i=0}^{n-1} \|x_i - x_{i-1}\| \tag{2}$$

$$H(p) = \frac{\log(\frac{L(p)}{d(p)})}{\log(n-1)} \cdot d_\theta(p) \tag{3}$$

Where $d(p)$ is the diameter of the minimum circle encompassing the trajectory; $d_\theta(p)$ is the scaled version of $d(p)$ so that the range of $d_\theta(\cdot)$ value across the set of trackers, $\{d_\theta(x), \forall x \in \theta\}$, is $[0, 1]$; and $L(p)$ is defined as the length of the trajectory.

A given tracker p is defined as a vector of n positions relative to the t