

Workshop on Industrial Applications

Proposed topic:

The automatic determination of atmospheric visibility from real-time images of video cameras

“Visibility” is defined as the greatest distance at which a black object of suitable dimensions, located near the ground, can be seen and recognized when observed against a scattering background of fog, sky, etc. This definition is based on human observation of atmospheric visibility conditions.

Instrumental observations of visibility are based on measurements of attenuation of light due to both scattering and absorption by particles in the air along the path of a light beam or by measuring the scatter coefficient of light within a volume of air. Both methods have their limitations as only a small volume of air is sampled in the determination of visibility and may produce large errors when the source of reduction in visibility is far away from the sampled air volume.

Nowadays, video cameras are widely used for remote monitoring and security surveillance purposes. Visibility estimation using digitized video images through identification of targets at known distance from the camera is a potential application. It has an intrinsic advantage over the instrumental light-absorption/scattered approaches in that the image acquisition processes between the camera lens system and the human eye are similar.

The use of images from video cameras for the automatic observation of visibility is non-trivial. The determination of visibility from images is affected by the size and shape of the reference targets, the contrast of the targets and their background and weather conditions (see attached photos). The objective of this research topic is to develop an efficient automatic algorithm to compute visibility through the processing of images captured by video cameras.

Cheung Chau Tue Jul 5 09:15:48 2005



Cheung Chau Tue Mar 28 08:45:03 2006



1(a) Photo with good contrast showing clearly distant hills that are over 20 km away

1(b) Photo of the same view but with reduced visibility. A small island on the top right corner of the photo is just barely seen.

HKO TsimShaTsui Wed Jul 14 07:15:02 2004



HKO TsimShaTsui Wed Jul 14 16:15:01 2004



2(a) Photo affected significantly by the backlight caused by the morning sun

2(b) Photo of the same place captured in the afternoon on the same day, with good contrast for the landmarks