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Thesis Title: "Detection of Movement in Video Images"
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ABSTRACT

This is a PhD thesis presenting a research project to investigate some non classic techniques for the *detection of movement in video images*. The *motivation* behind this work is to introduce two related *deliverables* under empirical approach. The first is the *compound method* for color/grayscale image *analysis and processing* of static/dynamic indoor/outdoor video frames. The second deliverable is the underlying supporting *multifunctional system*. This has encompassed the realization of various *stages* of the said method and system to achieve the compound *moving objects analyses* involving *motion detection, object segmentation, features extraction,* and *velocity computation* in the examined sequence of video frames, with five appropriate models for *background updating*. The software side comprises the requisite *modules* implementing the fundamental algorithms of the system kernel designed, simulated, coded, then validated under MATLAB7.3. The velocity computation in this phase believes that the *motion* of a moving object registered by *two* successive video frames can be 'analyzed' to compute its *velocity* through *extracting* then *comparing* the object's *centroid* position in both frames. The design of the system software was practically based on *cross-fertilizing* several essential concepts of: *morphological background estimation* scheme, *initial frames averageing, background subtraction, Binary Gradient Masking,* and *Direct Thresholding*. The hardware side has handled the configuration of the *physical layout* holding the experimental platform needed to support initial experiments to investigate particular aspects of the problem. The imagery requirement was met by a CCD camera system plugged-in a dedicated P4 PC-based *image processing* workstation. The concept of *Background Updating* has furthermore been *adopted* in analyzing dynamic video frames on a *fixed / Changeable value threshold* basis. Experimentation input in this phase involved individual frames (*still* pictures) besides *successive frames* of a captured video clips. The purpose of this phase has been extended to evaluate the relative *system*

performance incorporating classical and novel classes of algorithms. The second phase has demonstrated the *modification* of the first phase to explore some new relevant horizons. Velocity computation in this phase believes in *marrying* the two independent segmentation approaches; *background subtraction* and *temporal frames differencing*, through a 'single' *correlation* exhibited in the presented *behavioral–mathematical model*. This involves identifying the image as *time-varying functions* applicable for processing through 2D *Discrete Fourier Transform* (DFT). The mechanism of background updating has hereby been intrinsically *modified* within some other *empirical* different *dimensions* to *effectively* handle the concept of *adaptive thresholding*. The experimentation input for processing in this phase required the CCD camera successive frames of the captured video clips. The *justification of competence* of this system and the presented specific algorithms has been clearly exhibited through the *output data*, *human visual perceptual inspection*, plus *histogramming*. It showed an appreciable *level of performance* in comparison with some recent works including standard techniques. This has been practically interpreted in a *decrease in processing time* under *lower level of noise*. The system is valid for a wide range of applications involving: traffic measurements, HCI, computer vision, image processing, machine vision, security systems, computer-controlled manufacturing, and process control general and military applications.