

Context-Aware Adaptive Biometrics System using Multiagents

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Abstract

Traditional biometric systems are designed and configured to operate in predefined circumstances to address the needs of a particular application. The performance of such biometrics systems tend to decrease because when they encounter varying conditions as they are unable to adapt to such variations. Many real-life scenarios require identification systems to recognise uncooperative people in uncontrolled environments. Therefore, there is a real need to design biometric systems that are aware of their context and be able to adapt to changing conditions.

The context-awareness and adaptation of a biometric system are based on a set of factors that include: the application (e.g. healthcare system, border control, unlock smart devices), environment (e.g. quiet/noisy, indoor/outdoor), desired and pre-defined requirements (e.g. speed, usability, reliability, accuracy, robustness to high/low quality samples), user of the system (e.g. cooperative or non-cooperative), the chosen modality (e.g. face, speech, gesture signature), and used techniques (e.g. pre-processing to normalise and clean biometrics data, feature extraction and classification). These factors are linked and might affect each other, hence the system has to work adaptively to meet its overall aim based to its operational context.

The aim of this research is to develop a multiagent based framework to represent a context-aware adaptive biometric system. This is to improve the decision making process at each processing step of traditional biometric identification systems. Agents will be used to provide the system with intelligence, adaptation, flexibility, automation, and reliability during the identification process. The framework will accommodate at least five agents, one for each of the five main processing steps of a typical biometric system (i.e. data capture, pre-processing, feature extraction, classification and decision). Each agent can contribute differently towards its designated goal to achieve the best possible solution by selecting/ applying the best technique. For example, an agent can be used to assess the quality of the input biometric sample to ensure the important features can be extracted and processed in further steps. Another agent can be used to pre-process the biometric sample if necessary. A third agent is used to select the appropriate set of features followed by another to select a suitable classifier that works well in a given condition.

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