

論文 / 著書情報  
Article / Book Information

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種別(和文)	論文要旨
Type(English)	Summary

(博士課程)  
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## 論文要旨

THESIS SUMMARY

専攻 : Department of	計算工学	専攻	申請学位 (専攻分野) : 博士 Academic Degree Requested Doctor of	(工学)
学籍番号 : Student ID Number			指導教員 (主) : Academic Advisor(main)	(教授) 篠田 浩一
学生氏名 : Student's Name	Felipe Gomez Caballero		指導教員 (副) : Academic Advisor(sub)	

要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words)

The dissertation "A statistical approach for person authentication using human behavioral patterns" consists of 7 Chapters.

Chapter 1 [Introduction] presents a brief description of previous related approaches, as well as an overview and objectives of the presented research. A brief explanation of biometrics methods using human motion for the purpose of identity recognition is given along with a description of their disadvantages. The chapter focuses on emphasizing the importance of human motion stability, the robustness of the models that serve as representation of identity and the precise tracking of human motion on video sequences for the extraction of anthropometric and kinematic features.

Chapter 2 [Behavioral biometrics] provides an overview of the analysis of human motion for person authentication in the field of behavioral biometrics. First, a number of studies in the field of psychology and biomechanics focusing on the perception and analysis of biological motion are described, emphasizing the characteristics, advantages and disadvantages of human motion. Finally, an overview of the behavioral biometrics methods that rely on the characteristics of human motion is provided. Methods such as Gait recognition and upper body motion-based recognition are reviewed in this chapter since they share similar principles with the approach proposed on this study.

Chapter 3 [Statistical modeling approaches] describes the statistical modeling and adaptation techniques used to robustly model behavioral patterns exhibit in human motion. This chapter focused on modeling approaches such as the Gaussian mixture model (GMM), hidden Markov model (HMM) and support vector machine (SVM) since they are capable of handling intra-individual variations in human movements. A review of model adaptation techniques and the combination of GMM with SVM is also presented.

Chapter 4 [Acquisition and analysis of 3D human movements] gives a detailed definition of the human movements that are analyzed on this study. It focuses on individuality of 'simple movements' and stability of 'complex movements', as well as possible target applications. Simple movements analyzed on this study consist of "raising left arm" and "raising right arm" movements, which can be executed in a stable manner without the need of special training. By using these movements, we aim to take advantage of the individuality of the upper body motion for identity recognition applications where a visual or spatial constraint is imposed. The complex movements analyzed on this study consist of a sequence of gestures imposed by the system and different subject-preferred movements. The predefined sequence of gestures consists of three consecutive gestures, which aims to capture synchronized and sequential limb movement. For the subject-preferred movements, the participants selected familiar movements that require physical coordination and which they were confident on repeating in a stable manner. The movements include aerobics, jumps, soccer kicks, martial arts, dance steps, tennis swing, table tennis swing, badminton swing, batting and pitching. This Chapter also provides a description of the methods, conditions and apparatus employed for the acquisition of human movements that constitute the data sets used for experimentation.

Chapter 5 [Person recognition using simple upper body movement] describes the method implemented for person recognition by using behavioral patterns from simple movements. First, it provides a description of the algorithm created for the extraction of anthropometric and kinematic features from specific parts of the upper body. Second, it describes the implementation of modeling techniques presented in Chapter 3 for the tasks of person identification and person verification. Third, the results of both identification and verification task are presented, focusing on the discussion and analysis of the performance of the implemented modeling techniques and the effectiveness of the analyzed features. An accuracy test of the tracking system used during feature extraction is also presented and its results are discussed. Finally, it provides a summary of the findings, which demonstrate that anthropometric and kinematic features are effective for the representation of behavioral patterns from human motion and that by using model adaptation techniques we are able to create robust models that represent the person identity.

Chapter 6 [Robustness of complex human movement for person verification] presents the robustness analysis of the subject-preferred movements and the predefined sequence of gestures against forgery attacks by impostors for person verification tasks. First, it provides a description of the anthropometric and kinematic features extracted from specific joints of the human body. Second, it describes the modeling approach used to model the behavioral patterns from complex movements and the conditions in which the forgery attacks by impostors are introduced. Third, results of person verification task are presented, focusing on the performance analysis of systems using either subject-preferred movements or a predefined sequence. The analysis of specific subject-preferred movements is also provided to demonstrate that independent and rhythmic movement of body parts carries a significant amount of behavioral information. Finally, it provides a summary of the findings, which demonstrate that subject-preferred movements are more robust against forgery attacks by impostors than a predefined sequence of gestures.

Finally, In Chapter 7 [Conclusions and future work] the conclusions of this study and future work are described.

備考 : 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 2 部提出してください。

Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 2 copies of 800 Words (English).