visuAAL

Privacy-Aware and Acceptable Video-Based Technologies and Services for Active and Assisted Living

Context recognition for the application of visual privacy

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About me

Education

April 2021- May 2024

Ph.D. Candidate
Computer Science and Machine Vision
University of Alicante, Spain

September 2015- September 2018

M.Sc. Telecom Engineering
Digital Signal Processing
Iran Broadcasting University, Iran

September 2011- September 2015

B.Sc. Electrical Engineering
Digital Signal Processing
KNTU University, Iran

External Research Experience

October 2022- January 2023

Visiting Researcher
Fall Detection Technologies
Maynooth University, Ireland

Non-academic Work Experience

June 2019- March 2021

Computer Vision Engineer
Developing AI solutions for E-KYC
UID, Iran

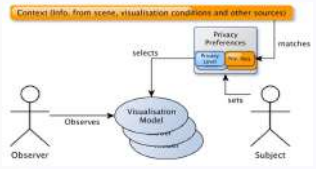
About The Project

This project is part of the bigger research consortium visuAAL – Privacy-Aware and Acceptable Video-Based Technologies and Services for Active and Assisted Living, with the goal of bridging the knowledge gap between users' requirements and the appropriate and secure use of video-based AAL technologies to provide effective and supportive care to older adults managing their health and wellbeing.
This research, with a technological approach, will be making use of data captured of persons acting in a monitored environment. These environments will use a variety of sensors: mainly cameras but also other less intrusive video-based devices such as 3D and thermal sensors, and smart home sensors. Regarding the privacy, in previous work, privacy-by-context, a level-based visualization was introduced. The aim of this project is to make the visualization selection automatic according to the context.

Objectives

The research goal is to analyse the variables which could be important in a matter of privacy and then develop novel methods to use these variables to interpret the video by artificial intelligence. Recognizing the context in video is one of the main step to achieve privacy by context systems in monitoring with video cameras. To achieve these goals, several research procedures will be performed throughout the course of the project:

- What are the variables which take part when considering the context of a video?
- What are the best methods and their pros and cons?
- Acquisition of a realistic data set with a range of video-based devices
- Development of novel methods for automatic context recognition
- Evaluation of the system in real-life applications

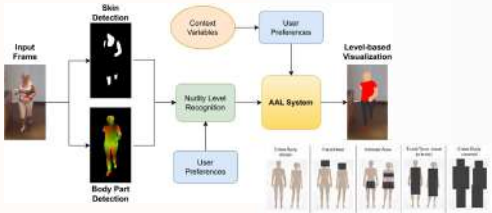


Methodology

To develop a context recognition system, which provides enough information to people and could empower them to adapt privacy to their preference, first, the important context variable in video regarding the privacy are defined and then, the provided solutions are reviewed. After gathering the in-depth information about the field, new Deep Learning based solutions are developed for daily activity recognition, appearance recognition, and fall detection.

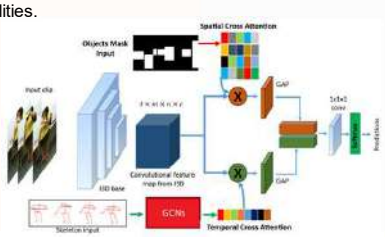
Appearance Detection

The proposed methodology is and shows the general pipeline of video-based AAL system, with the focus on nudity. Regarding the appearance, the skin detection module extracts the skin exposure map from a video frame, while the body detection module segments the frame for different body parts such as hands, torso, and legs. Skin detection consists of an FCN model using attention mechanisms which outputs skin probability map of the input image. For body part detection, the state-of-the-art method is utilized. By overlapping skin exposure map and body map, exposure ratio for each part can be achieved separately.



Daily Activity Recognition

In our envisioned daily activity recognition system, we have integrated various modalities, including RGB images and skeleton data, to enhance comprehension in complex scenarios. To capitalize on contextual information within the, we employed object detection techniques. Furthermore, our approach incorporates a 3D CNN for robust feature extraction and utilizes the Transformers' cross-attention mechanism for the information integration from different data modalities.



Fall Detection

In this study, we have evaluated the effectiveness of different pre-trained and fine-tuned object detection models for detecting fallen persons, with the goal of enabling assistive robots to detect and respond to fall incidents. Moreover, we have demonstrated that through knowledge distillation, we can achieve close to real-time performance levels using smaller models, which are more practical for deployment on edge devices with limited resources. To test the models in real-world scenarios, we used a set of in-the-wild videos recorded by a patrol robot, resulting in 500 high-quality images

Future Interest

I am passionate about pursuing my career AI, with a particular focus on computer vision. The prospect of delving into the intricate world of visual data analysis and creating innovative solutions to real-world problems fascinates me. My future interests lie in conducting ongoing research in the field of computer vision, and ultimately applying my findings to address practical challenges.

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