Impact Factor:					
	ISRA (India) = **6.317**	**SIS** (USA) = **0.912**	**ICV** (Poland) = **6.630**
	ISI (Dubai, UAE) = **1.582**	**РИНЦ** (Russia) = **0.126**	**PIF** (India) = **1.940**
	GIF (Australia) = **0.564**	**ESJI** (KZ) = **9.035**	**IBI** (India) = **4.260**
	JIF = **1.500**	**SJIF** (Morocco) = **7.184**	**OAJI** (USA) = **0.350**

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2021 **Issue:** 07 **Volume:** 99

Published: 10.07.2021 **http://T-Science.org**

QR – Issue **QR – Article**

Jamoliddin Uraimov
Chonnam National University
M.D., Department of Computer Engineering,
South Korea,
(corresponding author); (+8210-5418-0392).
uraimovuzbkor@gmail.com

Nosirjon Abdurazaqov
Andijan State University
Assistant professor, Department of
Computer Engineering, Uzbekistan,
(co-author), (+99899-816-8591).
nabdurazaqov@gmail.com

AGE AND GENDER DETECTION FROM LIVE CAMERAS FOR FUTURE SMART SHOPPING STORES

Abstract: *In the future, artificial intelligence can influence marketing strategies, including business models, sales processes, and customer service opportunities, as well as customer behavior. This is evidenced by the fact that today the role of high technology in all areas is growing. In developed countries, Smart Stores are traditional retail chains and use high technology. These include Live cameras that can detect age and gender. This article discusses how to identify age and gender in smart stores via live cameras.*

Key words: *camera, technology, smart store, live camera, picture, gender, age, products.*

Language: *English*

Citation: Uraimov, J., & Abdurazaqov, N. (2021). Age and gender detection from live cameras for future smart shopping stores. *ISJ Theoretical & Applied Science, 07 (99),* 56-61.

Soi: http://s-o-i.org/1.1/TAS-07-99-14 ***Doi***: https://dx.doi.org/10.15863/TAS.2021.07.99.14

Scopus ASCC: *1702.*

Introduction

Cameras and sensors that do not identify people or store any images are being tested in smart stores. The label does not say where the cameras or sensors are, but there is a web address for a privacy policy. In this article we are going to talk about age and gender detection by live cameras in smart stores, and how they proceeded to further function. Although we cited experienced research, our aim is to give more suggestions on developing such high-tecs.

Literature review

Christophe von der Malsburg and his research team at the University of Bochum developed the Elastic Bunch Graph Matching program in the mid-1990s. By 1997, the facial recognition method developed by Malsburg had surpassed most facial recognition systems on the market.

In 1977, Canada published the first detailed book on facial recognition technology. In 1993, the Defense Advanced Research Projects Agency launched FERET,[1] a face recognition technology program to develop "face recognition automatic capability" that can be used in "real-life situations" to help ensure security. Tested face recognition systems tested in research laboratories have been evaluated, and FERET tests have shown that although the performance of automated facial recognition systems

[1] *https://www.nist.gov/programs-projects/face-recognition-technology-feret*

varies, several available methods can be used to recognize faces in motionless images obtained in a controlled environment. FERET tests have created three U.S. companies that sell automated face recognition systems.

Popular recognition algorithms include basic component analysis using their faces, linear discriminant analysis, elastic beam graph adjustment using the Fisherface algorithm, latent Markov model, multi-line subspace study using a tensor representative, and neuron-based dynamic linking.

A facial recognition system[2] is a technology that can match a person's face from a digital image or video frame to a face database, usually used to conduct user identification through identification verification services, by accurately identifying and measuring facial features from a given image works.

After the FERET facial recognition test in 1993, the first government agencies to use automated facial recognition systems to prevent and identify people who received multiple driver's licenses under different names emerged. It has also been found that tools such as mustaches, beards, altered hairstyles and goggles, and even sunglasses can impede identification. Real-time face detection in the video was experimented within 2001 by Viola-Jones. Paul Viola and Michael Jones launched AdaBoost, a front-facing face detector that detects objects in digital images. By 2015, the Viola-Jones algorithm was implemented in manual devices and built-in systems using small weak detectors.

Research on three-dimensional face detection has made it possible to develop complex sensors that reflect systemic light to the face. The 3D matching methodology[3] is sensitive to expressions, so Technion researchers used tools from metric geometry to treat expressions as isometry. The new method of taking 3D images of faces uses three surveillance cameras aimed at different angles: one camera points to the front of the subject, the other to the side, and the third to the corner.

Android 4.0 Ice Cream Sandwich has added face detection using the smartphone's front camera as a device unlocking tool. In 2017, the iPhone X introduced product recognition with its Face ID platform using its infrared lighting system. In June 2020, Tiktok released a statement on its "For You" page and how to recommend videos that do not include face recognition to users. However, in 2021, Tiktok claimed to use facial recognition in user videos and its algorithm to identify age, gender, and ethnicity.

Discussion

Cameras that predict age and gender

One aspect of the technology is that they show products on the screen based on your perceptual mood, for example, if the cameras think you are sad, they will see ads for anti-depressant medications. For example, at a retail show in New York, USA, a smart shelf displayed by Mood Media tried to define "happiness" or "fear" when standing in front of people. Such technologies can allow targeted placement of products or on-screen ads in smart stores. one such breakthrough in technology is live cameras, which try to predict your age, gender, or mood as you go along. Currently, experts are testing live cameras[4].

The purpose of setting up live cameras is a commercial strategy, not to surprise people. It displays advertisements and product offerings that target the gender or age group of the customer. Experts say the cameras can predict the age and gender of the buyer, but do not store data.

The performance function of live cameras is that body-based gender is determined using images taken from visible and thermal cameras. According to the options included, it can quickly analyze the appearance of the whole body in both visible light and thermal images. Then, the priority characters in the body in the picture provide information about gender.

Below we describe the method of gender recognition using a combination of visible light and thermal images of the entire human body. There is a lot of research on the problem of gender identification. In our article, we will focus on a new gender detection method based on a combination of visible light and thermal images of the body.

The novelty of this method is that, first, it identifies the sexes using visible light and thermal images of the entire human body. Second, there are no previous studies that use a combination of visible light and thermal images of the entire human body for the problem of sex determination. Third, based on the boxes of the body visible and detected in thermal images, gender recognition features are derived from visible light and thermal imaging. In short, with this method, live cameras have a system input that contains the sex information of the human body. Using special sensors of the camera, images and characters are captured and then used to determine gender.

It should be noted that systems that use fingerprints, facial and combined fingerprint images are more effective for gender identification problems. But these systems require the cooperation of users in taking pictures.

Recognition of biological properties using the extraction method to isolate image features is presented as an effective method. A linear support

[2] http://en.wikipedia.org/wiki/Facial_recognition_system
[3] https://www.turbosquid.com/Search/3D-Models/free/face

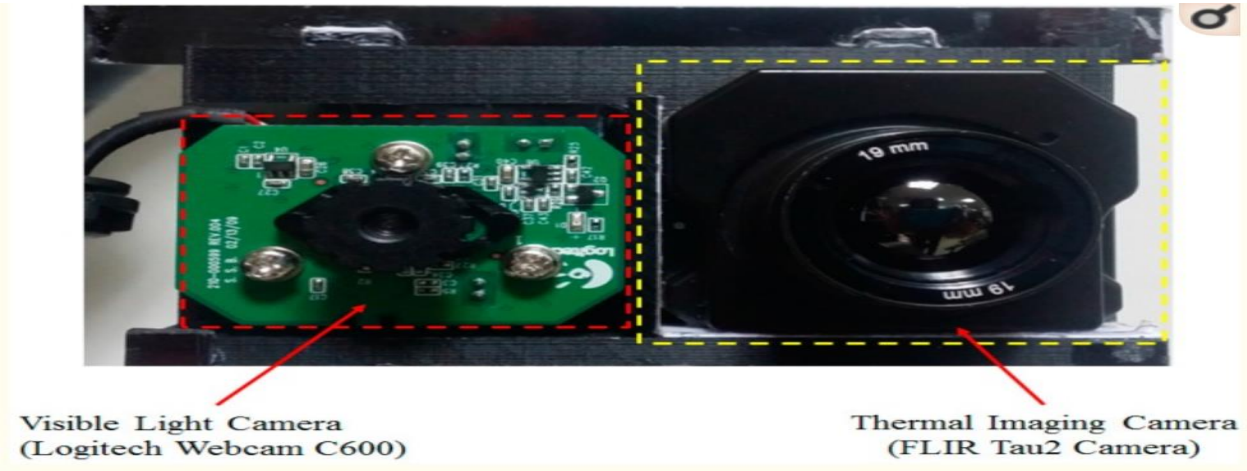
vector machine has also been used to classify rocks. However, the proposed active methods state that the appearance of the human body is determined by sex in two different types of images, visible light images, and thermal images. It combines two different combinatorial approaches, feature and point level, to combine visual and thermal image recognition results.

Picture 1.

Source: google.com

In a combined approach, it is possible to combine visual and thermal images of the whole body using ball fusion. The feature-level fusion approach, on the other hand, is created by combining the emitted property vector of visible and thermal images.

The details of determining the age of people and distinguishing image features are as follows: The features separated from the two types of images obtained are combined to form the final feature for gender recognition. It is recommended to take visible light and thermal images using two visible thermal cameras to determine the gender of visitors to the smart store via a live camera. A near-infrared light or a far-infrared light camera can be used to capture thermal images.



Picture 2.

Source: Sensors (Basel) PMC4801534

A study of some of the experiments revealed that: first, there is currently no public observation database that includes both visible light and thermal images; second, the experiments were performed using laboratory-manufactured devices. Here are some pictures are taken by two visible thermal cameras in one of the experiments:

Picture 3.

Source: Sensors (Basel) PMC4801534

Unlike a near-infrared light camera, a long infrared light camera captures image signals in the 8-12 μm wavelength range, and it does not require additional lighting to capture the image. Identifies body traits within images using methods to distinguish features to identify sexes.

The next step in this method is to separate image properties from images. According to the researchers, the technique of isolating the HoG properties of the oriented gradient has been successfully applied to the problem of human identification and gender identification.

According to the method described in the article, the problem of gender recognition based on the image of the human body is complicated by changes in the images on the photographed body.

To identify the sexes, two different characterization methods are used to distinguish the sexes more accurately. In this case, the HoG technique can be used to distinguish image features on the problem of sex determination. It is also mathematically determined by the equation:

$$LBP_{P,R} = \sum_{p=0}^{P-1} s\left(x_c - x_p\right) \times 2^p, \text{where } s\left(x\right) = \begin{cases} 0\, if\, x < 0 \\ 1\, otherwise \end{cases}$$

By comparing the central pixels with the pixels around P, the LBP function extraction method works as a custom boundary method to distinguish the image texture feature.

The LBP codes allocated to construct the image property are divided into identical and non-identical codes.

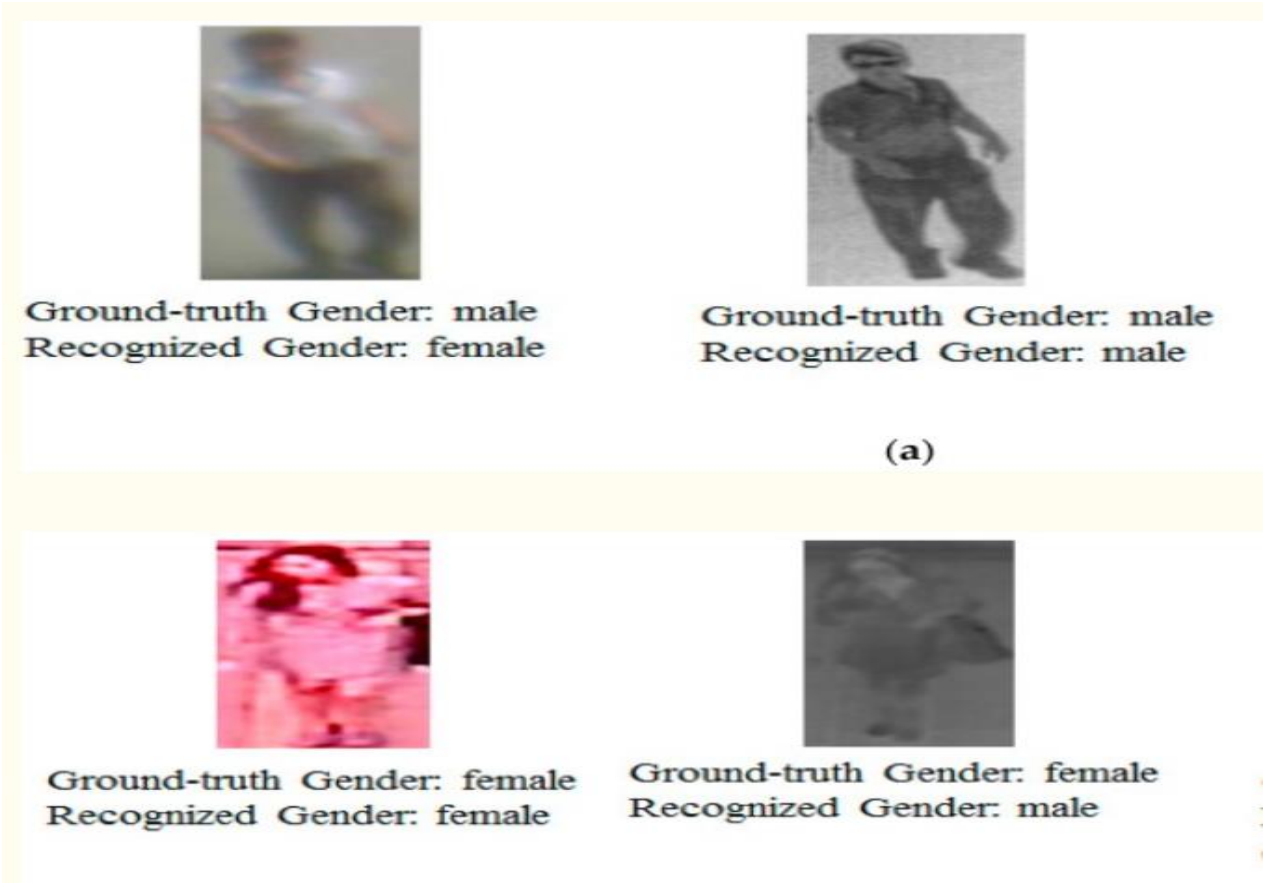
To extract image properties more efficiently, some researchers have divided the image into sub-blocks and created an image feature by combining the isolated properties of each sub-block.

The image properties extracted using this method include not only the global image property but also the local image property. On the other hand, non-uniform code describes the properties of a very complex image texture.

Based on this, we assign a specific decimal code from 0 to P to each group of invariant patterns of the same rotation. However, all non-identical codes are combined and assigned a decimal code (P + 1).

Results

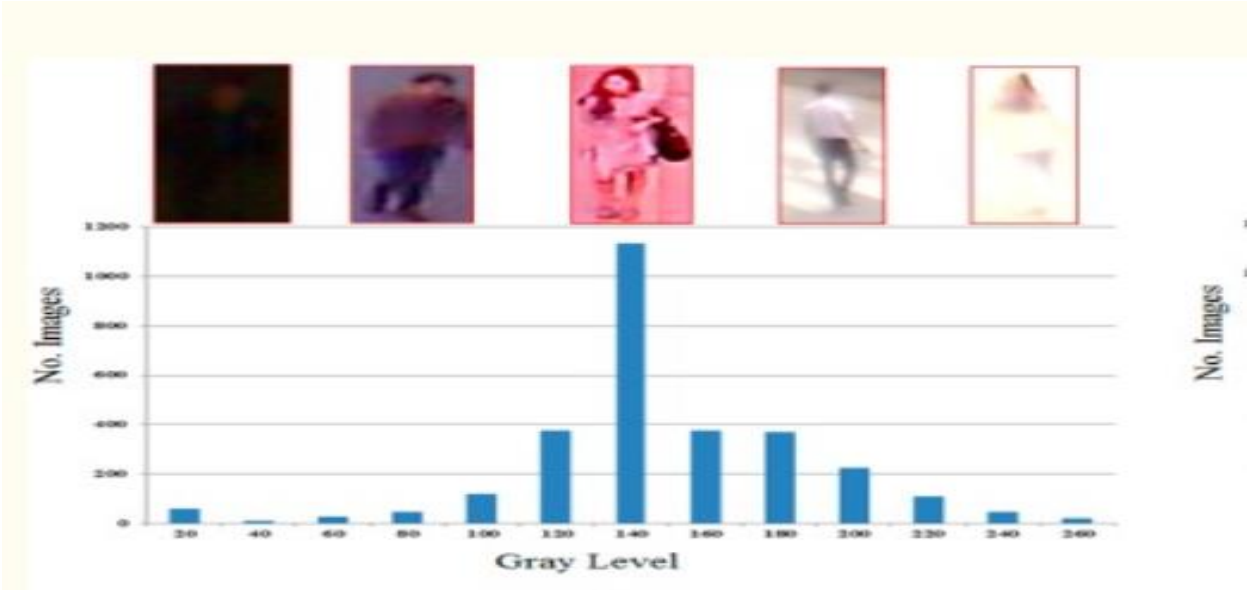
In the currently proposed live camera, the database is experimentally generated using the human detection method, and some of the visible light and thermal images of the full body can be summarized below:



Picture 4.

Source: Sensors (Basel) PMC4801534

The aforementioned "database" consists of 103 people: 66 men and 37 women. There are 5852 images of visible light and thermal images of the human body. The pictures are distinguished by background and body stands like the front, back, other side poses.



Picture 5.

Source: Sensors (Basel) PMC4801534

In some experiments, because the thermal camera captures images using infrared light that is irradiated due to body temperature, even if the lighting condition is poor (e.g., too dark or too bright), the full-body view in thermal images is background proved to be different.

According to the analysis of the experimental results, the combination of visible and thermal images helps to increase the accuracy of the recognition system. Based on the properties obtained using visible light and thermal images of the human body, a combination of visible and thermal images is performed to determine gender. It can also be concluded that even if recognition using single images of visible or thermal images fails a combination of the two types of images will give better recognition results. Using a combination of full-body visible and thermal images, it has been proven that recognition accuracy is enhanced compared to systems that use clear or thermal images. Experimental results showed that the combination of visible and thermal images produced greater accuracy than the methods of distinguishing features.

Conclusion

This article discusses the very method of sex determination using a combination of visible and thermal images of the human body through live cameras in smart stores. Hence, the recognition accuracy of systems that use only one visible image to determine gender is limited. It is also suggested that a larger database be compiled for experiments in this area and that recognition indicators be evaluated using different recognition methods. It is also possible to increase recognition accuracy by combating negative effects such as image quality and background, shadow effects.

References:

1. (n.d.). *Body-Based Gender Recognition Using Images from Visible and Thermal Cameras*. Retrieved from www.nih.gov
2. (n.d.). *An effective real time gender recognition system for smart cameras* | Request PDF Retrieved from www.researchgate.net
3. (n.d.). Retrieved from https://en.wikipedia.org/wiki/Three-dimensional_face_recognition
4. Prasad, J. (2017). *face recognition system with face detection.* Diss. India.
5. Aharoni, R. (2017). *History of Holon. Holon Municipality site.* Retrieved from http://www.holon.muni.il/English/CityOfHolon/Pages/History.aspx
6. Alley, D., Liebig, P., Pynoos, J., Banerjee, T., & Choi, I. H. (2007). Creating elder-friendly communities: preparations for an aging society. *Journal of Gerontological Social Work*, 49(1–2), 1–18. doi:10.1300/J083v49n04_01
7. Ball, M. S., & Smith, G. W. (1992). *Analyzing visual data*, Vol. 24. Newbury Park, CA: Sage.
8. Collier, J., & Collier, M. (1986). *Visual anthropology: Photography as a research method.* Albuquerque: University of New Mexico Press.
9. Fehr, B. (1995). *Friendship processes*, Vol. 12. Thousand Oaks, CA: Sage.
10. Rieger, J. H. (1996). Photographing social change∗. *Visual Studies*, 11(1), 5–49.
11. Shenk, D., & Schmid, R. M. (2001). *A Picture Is Worth ...: The use of photography in gerontological research.* In Rowles, G. D., & Schoenberg, N. E. (Eds.), Qualitative gerontology: A contemporary perspective. New York: Springer Publishing Company
12. (2007). *World Health Organization*. Global age-friendly cities: A guide. Geneva, Switzerland: WHO press.
13. Zeitler, E., & Buys, L. (2015). Mobility and out-of-home activities of older people living in suburban environments: 'Because I'm a driver, I don't have a problem'. *Ageing and Society*, 35(04), 785–808
14. Spain, D. (2014). Gender and urban space. *Annual Review of Sociology*, 40, 581–598