AI 멀티모달 센서 기반 보행자 영상인식 알고리즘

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AI Multimodal Sensor-based Pedestrian Image Recognition Algorithm

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● 요 약 ●

In this paper, we intend to develop a multimodal algorithm that secures recognition performance of over 95% in daytime illumination environments and secures recognition performance of over 90% in bad weather (rainfall and snow) and night illumination environments.

키워드: multimodal algorithm, recognition performance, illumination environment

I. Introduction

Multimodal deep learning imaging technology refers to AI image processing technology that utilizes deep learning technology based on learned knowledge information that finds spatial information such as type, size, direction, and location of objects in images in real time [1].

AI image processing technology constructs a context-aware model that includes domain knowledge required for each service field after going through image analysis and processing such as recognizing, interpreting, and inferring contextual information, including sensor data collected through various sensors. It is a service that recognizes objects, motions, situations, etc. by inferring contextual information through management [1].

II. Pedestrian recognition module performance target

• Recognition performance of over 95% in daylight conditions

• Recognition performance of over 90% in bad weather (rainfall and snow) and night illumination conditions

• Recognition performance of over 95% is secured even in daylight conditions, such as shaking of sensor-mounted structures, occlusion of some objects (30% or less), shadows, etc.

• Overcoming reliability deterioration factors due to the unique characteristics of existing single sensors (RGB, IR, thermal imaging, Radar, Lidar)

1) Selection of optimal specifications for multimodal sensors

- After TOF (Time Of Flight) and thermal sensor characteristics analysis, optimal depth sensor specification for outdoor environment is selected

- Selection of sensor specifications with RGB-D (Depth) output

3) Development of Deep Learning Pedestrian Recognition Algorithm based on RGB Image and Depth Information Convergence

4) RGB-T (hermal) feature extraction encoder design

5) Design of object recognition network model supporting heterogeneous stream data of RGB-T

III. Experiment

1) After TOF (Time Of Flight) and thermal sensor characteristics analysis, optimal depth sensor specification for outdoor environment is selected

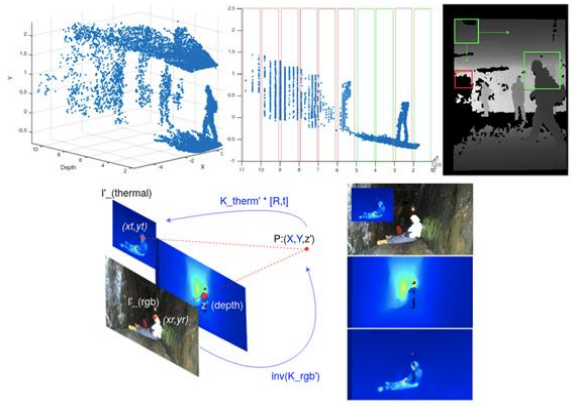

Fig. 1. Characteristics of Depth Sensor and Conceptual Diagram of RGB-Thermal Sensor Convergence

2) Development of Deep Learning Pedestrian Recognition Algorithm based on RGB Image and Depth Information Convergence

- Overcome detection performance deterioration due to false detection due to sensor vibration and occulusion by using artificial intelligence deep learning image recognition technology
- Deep learning CNN based RGB-D object detection architecture design.

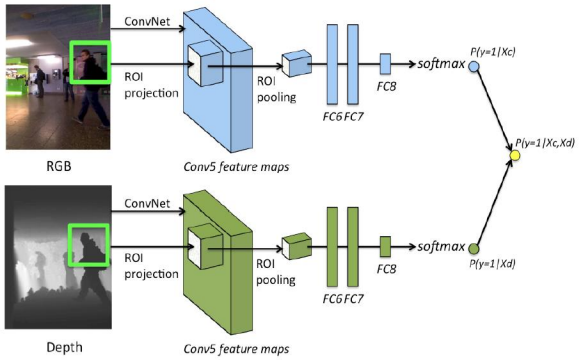

Fig. 2. Deep learning CNN based RGB-D object detection architecture

IV. Conclusions

In this paper, a multimodal algorithm that secures recognition performance of 95% or more in daytime illumination environment and secures recognition performance of 90% or more in bad weather conditions such as rain and snow and night illumination environment is performed. In a daytime illumination environment, it is possible to secure recognition performance of over 95% even in shaking of the sensor-mounted structure, occlusion of some objects (30% or less) and shadows, and unique characteristics of existing single sensors (RGB, IR, thermal image, Radar, Lidar) An algorithm was developed to overcome the reliability deterioration factor.

REFERENCES

[1] GONGHOON, "Image data-based multimodal imaging technology," GONGHOON Official Blog, [Internet] Available: https://m.post.naver.com/viewer/postView.naver?volumeNo=33335646&memberNo=56622287