한양대학교

# SW프로젝트 제안서

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|---|---|---|
| 프로젝트명 | 복잡한 환경에서 영상기반의 다중물체 추적기술 개발 | |
| 프로젝트 유형 | 지정 주제 ( O )<br>자유 주제 (  ) | 졸업 작품 ( O )<br>졸업 논문 (  ) |
| 프로젝트 요약 | 백화점, 마트, 영화관, 도로와 같은 환경에서 다수의 사람, 자동차 등을 추적하는 기술을 개발한다. 다중 물체추적기술은 영상기반의 알고리즘으로 개발하며, 비디오 영상을 이용하게 된다.비디오 영상에서 추적하고자 하는 다중 물체의 초기위치 정보가 주어지면 비디오의 매 프레임 마다 해당 물채들의 위치정보를 추적해야 한다. 다중 물체추적기술은 무인자동차, 지능형 CCTV등의 핵심기술로 컴퓨터비전 영역에서 매우 중요한 분야이다. | |
| **R&D** 산출물 | SW (O), HW (  ), 특허 (  ), 논문 (  ), 프로그램등록 (  ) | |
| 지도교수 | 임종우 | |
| 예상기간 | 2021.03.02-2021.06.22 | |

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# 목 차

## 1. 프로젝트 배경 및 목표

The MOT(Multi-object tracking) task is a very important task in the computer vision field currently. Multiple object tracking has important applications in fields such as intelligent monitoring, motion and behavior analysis, and autonomous driving. For example, in an automatic driving system, the object tracking algorithm needs to track the movement of moving cars, pedestrians, and other animals, and make predictions about their future positions, speeds and other information. Video Surveillance. Detect abnormal behavior, saving a lot of manpower and resources. Human-computer interaction. Recognition and processing of object interaction in complex scenes. The MOT have more commercial value in practical applications.

The problem of multi-object tracking is much more complicated and requires correlation and matching between targets. In addition, in multi-target tracking tasks, problems such as frequent occlusion of the object, unknown start and end time of the trajectory, too small object, similar appearance, interaction between object, low frame rate, etc. are often encountered in multi-object tracking tasks. Therefore, the MOT problem is more difficult.

In this project, we are going to improve the three evaluation indicators that are IDF1, IDs and FPS. If possible, we consider applying theory to practice deploying this project on real hardware devices.

## **2.** 프로젝트 내용

In this project we are going to improve the three evaluation indicators: IDF1, IDs and FPS. Refer to the paper FairMOT which gets SOTA in MOT tasks now.

First of all, the paper FairMOT uses the anchor-free method that centerNet, it improves the accuracy of object detection, thus, improving the accuracy of Re-ID task to get the final high accuracy of MOTA.

In our project, we pay more attention to the speed(get high FPS) of MOT task, therefore, we plan to use some lightweight architecture, maybe ResNet50-0.25 or HRNetV2-W18 as the backbone of centerNet in FairMOT to improve the speed and FLOPs. The lightweight networks architecture is meaningful to deploy on embedding devices in the future.

Next, we think that ‘object detect, Re-ID’ repetitive processing may be not efficient in MOT tasks, therefore, we plan to use LSTM, etc. networks to deal with the object tracking under severe occlusion and mul-tiple missing detection.

Finally, trying to apply theory to practice deploying this project on real hardware devices. The lightweight object detection architecture is beneficial for deploying on embedding and mobile devices.

## **3.** 프로젝트 추진 계획

| Date/member | 장호우 | 최태혁 |
|---|---|---|
| 2021.03.02-03.15 | 拟定计划 | 收集资料 |
| 2021.03.15-03.31 | 复现 FairMOT | 准备数据集 |
| 2021.04.01-04.15 | 搭模型 | 搭模型 |
| 2021.04.15-04.30 | 阶段性汇报 | 阶段性汇报 |
| 2021.05.01-05.15 | 修改模型 | 修改模型 |
| 2021.05.15-05.31 | 训练模型 | 评估 |
| 2021.06.01-06.15 | 资料补足 | 文书总结 |
| 2021.06.15-06.22 | 最终汇报 | 最终汇报 |

## **4.** 결론

As a capstone project, it will be the pinnacle of university expertise in the past four years. We think that we could improve at least one of the three expected evaluation indicators that are IDs, IDF1 and FPS in MOT tasks via this project.

This project would train our programming skill and the experience of industry project application.

Throughout this project, it will be helpful and meaningful for us. For example, team projects can help us develop a host of skills that are increasingly important in the professional world, reinforce skills that are relevant to both group and individual work.

As we said abore, that MOT task have more commercial value in practical applications. Our method can deploy on the embedding and mobile devices.

## **5.** 참고 문헌

[1] Zhan, Y., Wang, C., Wang, X., Zeng, W., & Liu, W. (2020). A simple baseline for multi-object tracking. arXiv preprint arXiv:2004.01888.

[2] Zhou, X., Wang, D., & Krähenbühl, P. (2019). Objects as points. *arXiv preprint arXiv:1904.07850*.

[3] Zhou, X., Koltun, V., & Krähenbühl, P. (2020, August). Tracking objects as points. In European Conference on Computer Vision (pp. 474-490). Springer, Cham.

[4] Duan, K., Bai, S., Xie, L., Qi, H., Huang, Q., & Tian, Q. (2019). Centernet: Keypoint triplets for object detection. In *Proceedings of the IEEE/CVF International Conference on Computer Vision* (pp. 6569-6578).

[5] Yu, J., Xie, H., Li, M., Xie, G., Yu, Y., & Chen, C. W. (2020, July). Mobile Centernet for Embedded Deep Learning Object Detection. In 2020 IEEE International Conference on Multimedia & Expo Workshops (ICMEW) (pp. 1-6). IEEE.

[6] Hochreiter, S., & Schmidhuber, J. (1997). Long short-term memory. *Neural computation*, *9*(8), 1735-1780.

[7] Saleh, F., Aliakbarian, S., Salzmann, M., & Gould, S. (2020). Artist: Autoregressive trajectory inpainting and scoring for tracking. *arXiv preprint arXiv:2004.07482*.

[8] Kim, C., Li, F., & Rehg, J. M. (2018). Multi-object tracking with neural gating using bilinear lstm. In *Proceedings of the European Conference on Computer Vision (ECCV)* (pp. 200-215).