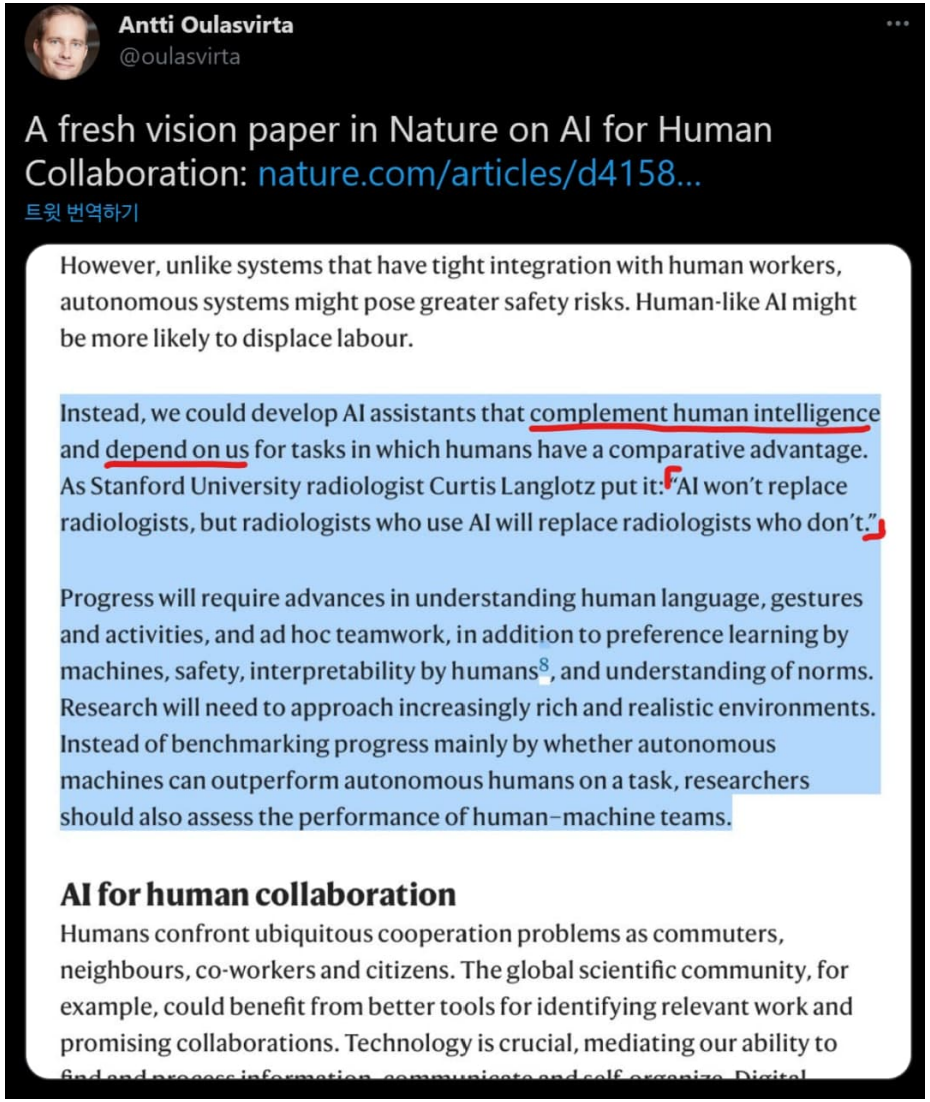
운전 보조 시스템: 졸음 운전 방지

2021-1 차량지능기초 전반부 최종 프로젝트

`20203155 추헌준`

인간 + 기술



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A fresh vision paper in Nature on AI for Human Collaboration: nature.com/articles/d4158...

트윗 번역하기

However, unlike systems that have tight integration with human workers, autonomous systems might pose greater safety risks. Human-like AI might be more likely to displace labour.

Instead, we could develop AI assistants that complement human intelligence and depend on us for tasks in which humans have a comparative advantage. As Stanford University radiologist Curtis Langlotz put it: "AI won't replace radiologists, but radiologists who use AI will replace radiologists who don't."

Progress will require advances in understanding human language, gestures and activities, and ad hoc teamwork, in addition to preference learning by machines, safety, interpretability by humans[8], and understanding of norms. Research will need to approach increasingly rich and realistic environments. Instead of benchmarking progress mainly by whether autonomous machines can outperform autonomous humans on a task, researchers should also assess the performance of human–machine teams.

AI for human collaboration

Humans confront ubiquitous cooperation problems as commuters, neighbours, co-workers and citizens. The global scientific community, for example, could benefit from better tools for identifying relevant work and promising collaborations. Technology is crucial, mediating our ability to find and process information, communicate and self-organize. Digital

운전자 보조 시스템

> 졸음 운전을 줄이자

- 현재: 운전자 == 사람
  - 사람이므로 항상 피로하지 않고 운전할 수는 없음
- 졸음운전은 본인이 졸고 있다는 것을 자각하기가 쉽지 않음
  - 객관적으로 판단 가능한 기술이 필요

구현 세부 내용

- MediaPipe Face Mesh

핵심 아이디어

- 피곤하다는 신호 -> 하품을 하게 됨
    - 이를 감지하여 하품을 자주 하면 휴식을 권장하는 알림을 띄움

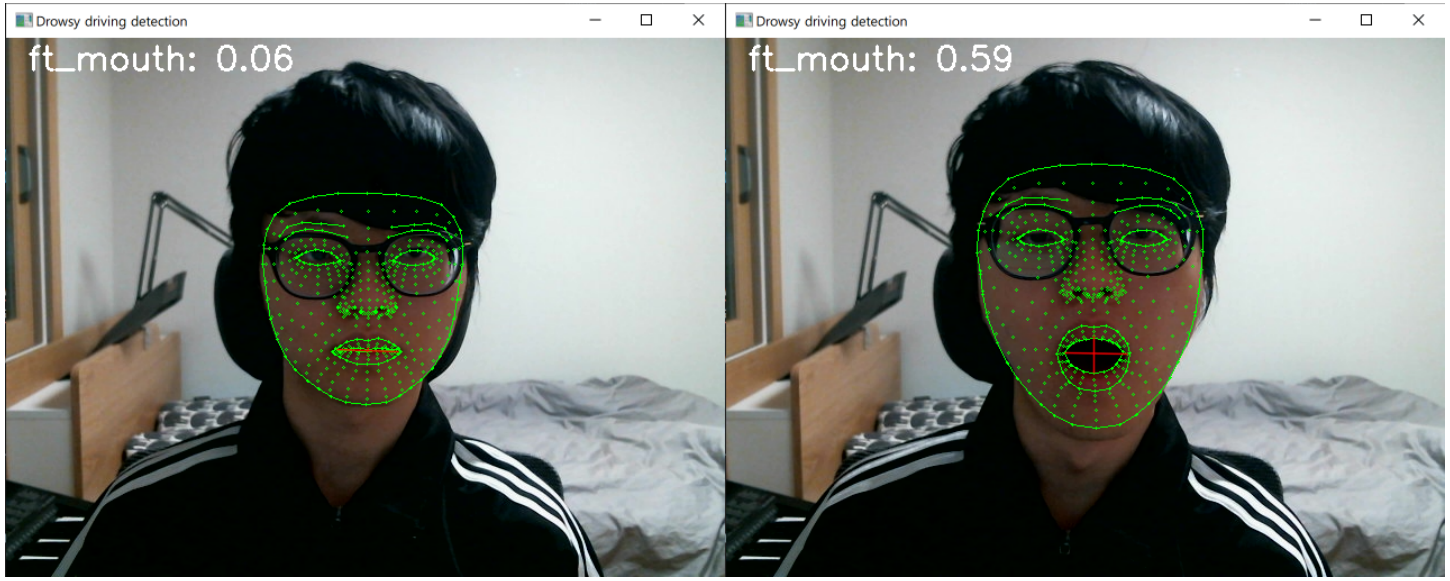
구현 방법

```
results = face_mesh.process(image) # result
len(results.multi_face_landmarks[0].landmark) ## == 486

for fp in results.multi_face_landmarks[0].landmark:
    [fp.x, fp.y, fp.z] # coordinates of each feature point
```

`landmark_coors_test.py` : MediaPipe Face Mesh의 포인트별 인덱스 시각화

`main.py` : entry point

```python
# Landmark point index
POS_MOUTH = ((12, 14), (78, 306)) # ((vertical), (horizontal))
DETECTION_THRESHOLD = 0.45

def feature_mouth(landmark_list):
    V = math.dist(landmark_list[POS_MOUTH[0][0]], landmark_list[POS_MOUTH[0][1]])
    H = math.dist(landmark_list[POS_MOUTH[1][0]], landmark_list[POS_MOUTH[1][1]])
    return V / H
```

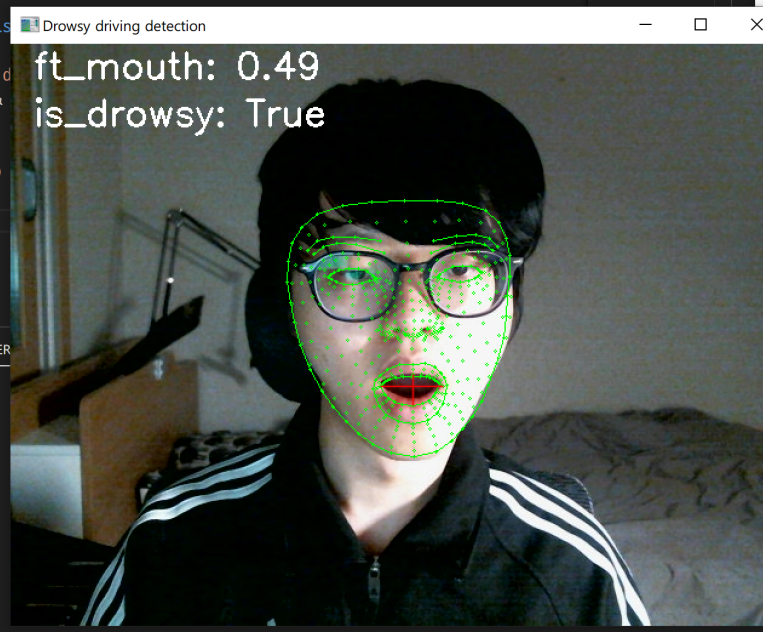


- 경계값(DETECTION_THRESHOLD) 에서 판정 결과가 매우 불안정해짐
- -> 평균 필터를 적용함으로써 해결

```
ft_mouth_list = []
def detect_drowsiness(ft_mouth):
    global ft_mouth_list
    if len(ft_mouth_list) < 30:
        ft_mouth_list.append(ft_mouth)
        return 'preparing...'
    else:
        ft_mouth_list.pop(0)
        ft_mouth_list.append(ft_mouth)
        if sum(ft_mouth_list) / 30 > DETECTION_THRESHOLD:
            return True
        else:
            return False
```

main.py > ...

```
86                  pt1 = tuple(map(int, landmark_list[POS_MOUTH[1][0]][:2]))
87                  pt2 = tuple(map(int, landmark_list[POS_MOUTH[1][1]][:2]))
88                  cv2.line(image, pt1, pt2,
89                      (0, 0, 255), 1, cv2.LINE_AA)
90
91                  ft_mouth = feature_mouth(landmark_list)
92
93              else:
94                  ft_mouth = -1
95
96
97              cv2.putText(image, f'ft_mouth: {ft_mouth:.2f}', (int(0.03*image.shape[1]), int(0.06
98                      cv2.FONT_HERSHEY_SIMPLEX, 1, (255, 255, 255), 2)
99
100             detected = detect_drowsiness(ft_mouth)
101             cv2.putText(image, f'is_drowsy: {detected}', (int(0.03*image.shape[1]), int(0.14*ima
102                 cv2.FONT_HERSHEY_SIMPLEX, 1, (255, 255, 255), 2)
103
104             if detected and not triggered:
105                 alert_driver(time.time() - t)
106                 triggered = True
107             elif not detected:
108                 triggered = Fals
109
110             cv2.imshow('Drowsy d
111             if cv2.waitKey(5) &
112                 break
113
114         cv2.destroyAllWindows()
115         cap.release()
116
```



PROBLEMS 44 DEBUG CONSOLE OUTPUT TER

```
Warning: driver is drowsy | t = 6.06
Warning: driver is drowsy | t = 10.68
Warning: driver is drowsy | t = 15.02
Warning: driver is drowsy | t = 15.89
Warning: driver is drowsy | t = 18.98
Warning: driver is drowsy | t = 41.59
Warning: driver is drowsy | t = 44.18
Warning: driver is drowsy | t = 46.05
Warning: driver is drowsy | t = 55.95
Warning: driver is drowsy | t = 335.59
Warning: driver is drowsy | t = 507.37
Warning: driver is drowsy | t = 702.37
Warning: driver is drowsy | t = 710.73
```

- `alert_driver(t)`

Demo

예상 성과

- 졸음운전 예방
- mediapipe의 모바일 배포에 따른 스마트폰 활용도 증가
- 지능형 경로 탐색

추후 확장 가능한 분야

- 차량의 주거공간화
  - 탑승자의 편의 추구
    - CV기술을 활용한 얼굴 인식 및 분석

감사합니다.