DAPS

(Distracted driving Accident Prevention System)

FORUM8

11th CPWC

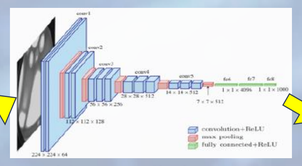
IFocus

BACKGROUND

Safety is the most important thing when driving a car. The **driver's distraction poses**, among other things, a significant risk. Behavior such as using smartphone greatly increases the likelihood of an accident. To prevent this and improve the driving environment, it is important to understand where the **driver's eyes are focused**. Especially in dangerous situations, it is important to predict abnormal objects in advance and always keep an eye on them. Accordingly, in order to solve the driver's distraction problem, we want to identify the risk situation in advance and establish an **attention distraction accident prevention system**.

CONCEPT

Setting an abnormal scenario



Accident prediction model

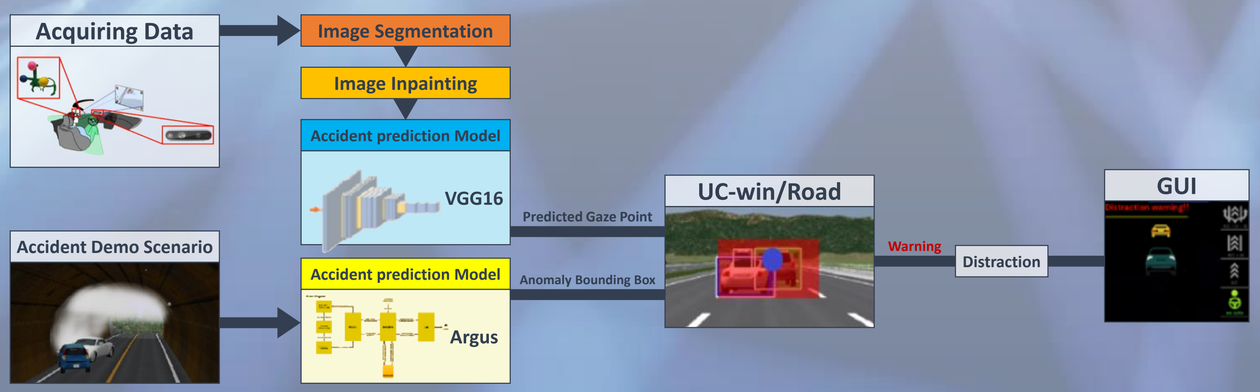
Accident prediction model

Testing at UC-win/Road

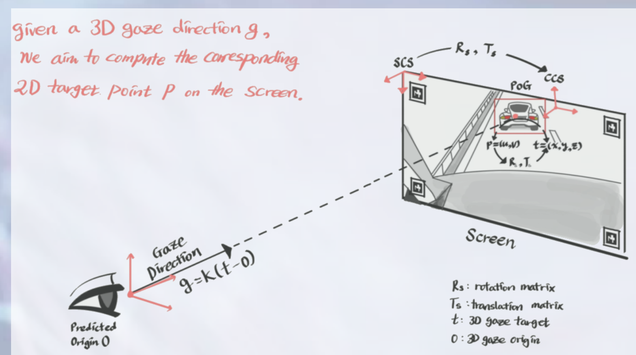
Distracted driving accident prevention system

Utilize UC-Win/Road simulation to build and simulate **anomaly scenarios**. Predict risk **situations** and create **bounding boxes**. At the same time, a deep learning model is utilized to estimate **the driver's gaze** and project the **2D gaze point** onto the uc-win screen to provide visual information to the driver. Finally, the GUI provides an appropriate warning by recognizing only the case where the estimated gaze point is not located in the bounding box in the predicted risk situation.

System Flow



DRIVER GAZE ESTIMATION MODEL



To deduce the equation of screen plane, We compute $n=R_S[:,2]=(n_x,n_y,n_z)$
Where n is the normal vector of screen plane.

The equation of screen plane is

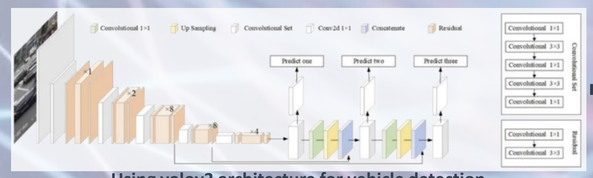
$$n_xX+n_yY+n_zZ=n_xt_x+n_yt_y+n_zt_z \quad (2)$$

Given a gaze direction g and the origin point o, we can write the equation of the line of sight as

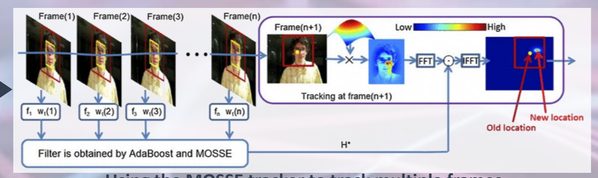
$$\frac{X-X_o}{g_x}=\frac{y-y_o}{g_y}=\frac{Z-Z_o}{g_z} \quad (3)$$

By solving (2),(3), We obtain the intersection t, and $(u,v,z)=R_S^{-1}(t-T_S)$,
Where z usually equals to 0 and $P=(u,v)$ is coordinate of 2D target point in the

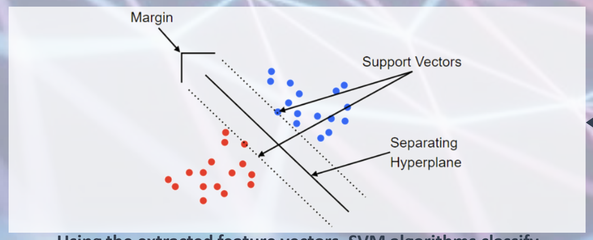
ACCIDENT PREDICTION MODEL



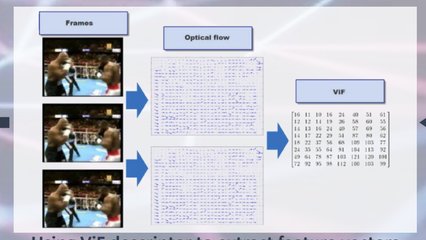
Using yolov3 architecture for vehicle detection



Using the MOSSE tracker to track multiple frames



Using the extracted feature vectors, SVM algorithms classify accidents in the following outputs



Using ViF descriptor to extract feature vectors

FUTURE WORK

CAN ANOMALY DETECTION

We want to further develop a system that provides essential information to the driver, not just the ability to detect accidents outside the vehicle and fault detection of critical driving elements using CAN communication. These developments play an important role in improving the safety of drivers. In addition, we will now develop vehicle-to-everything (V2X) communication so that information can be exchanged between cars. These advanced systems will inform the surrounding vehicles of the failure situation in their vehicles and further help prevent safety accidents.
These innovative technologies will help improve road safety and make the driver's experience safer and more efficient.