Driver's condition detection system using multimodal imaging and machine learning algorithms

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Project goal

The project's aim is to create, test, and improve a driver condition detection system using multimodal imaging and machine learning algorithms. The driver's condition is classified as tired or untired.

Intelligent driver assistance systems are becoming more crucial to keeping people safe on the road. According to EU guidelines, such systems must be installed in automobiles. As part of this project, an innovative system comprised of at least two cameras: RGB and thermal, as well as software implementing the designed and tested machine learning algorithms assessing, for example, a person's activity, temperature, breath frequency, and other parameters, should be developed.

What has been done

1. Conducting of a systematic literature review and becoming familiar with existing solutions for detecting driver fatigue.
2. Set up of a simulated driving environment for video data acquisition with the use of RGB camera and FLIR Lepton thermal camera, both of which were connected to the google Coral platform.
3. Presented labeled and thoroughly described proprietary dataset consisting of over 200 thermal and RGB videos
4. Processing of acquired data with the focus on driver’s eye state, mouth state and their breathing characteristics
5. Surveying and analysis of potential users sentiment towards proposed system
6. Implementation of chosen discriminator model and its training with the use of appropriately prepared data

Further possible developments

1. Further development of proposed dataset. Acquiring more data. Its potential publication free of charge for research purposes.
2. Implementation of the proposed system on lightweight platform (such as Google Coral or Raspberry Pi) for the use inside of a vehicle
3. Design and implementation of physical module for installation and safe use in the given vehicle
4. Conducting tests with the use of appropriately prepared real car
5. Research on the influence of environmental factors and drivers physical features on the performance of the system
6. Further research on users sentiment towards the system. Proposing implementation that would be positively assessed by the users.

Fig. 1. Prepared simulator

Fig. 2. Google Coral with RGB camera

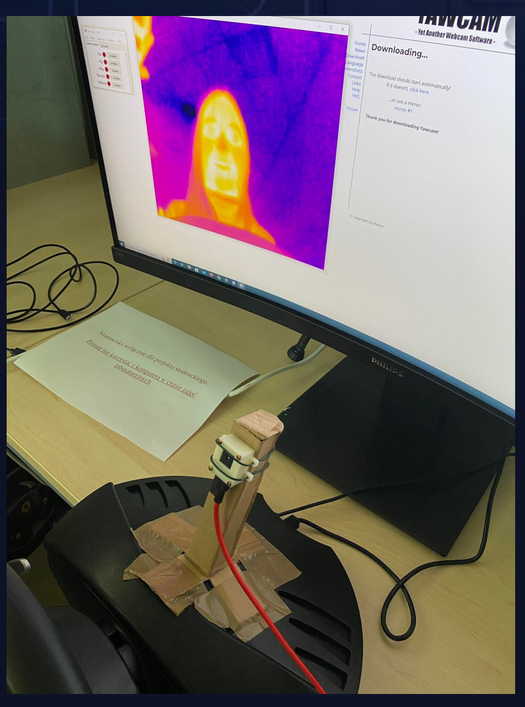

Fig. 3. Thermal camera

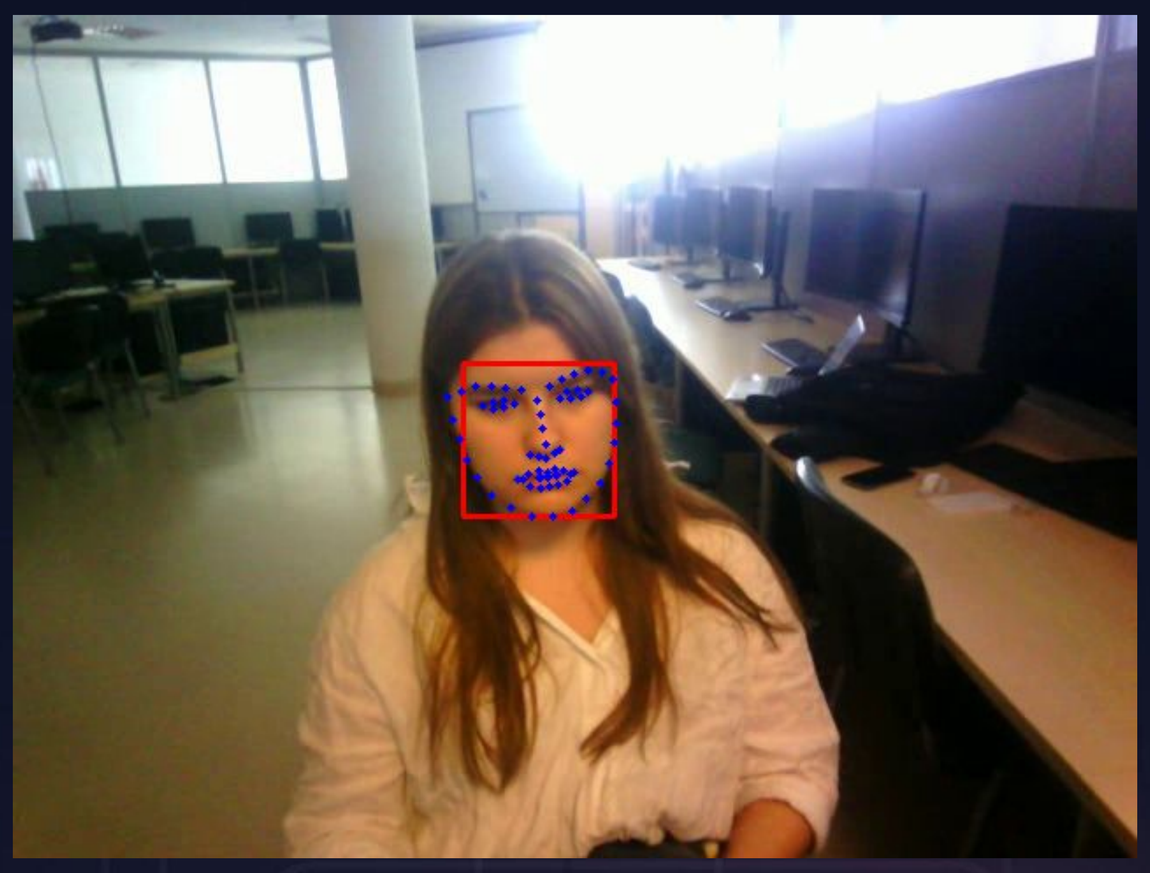

Fig. 4. Example of detection of facial points on a driver’s face

Projekt współfinansowany ze środków Unii Europejskiej w ramach Europejskiego Funduszu Rozwoju Regionalnego.
Program Operacyjny Polska Cyfrowa na lata 2014-2020.
Oś priorytetowa nr 3 „Cyfrowe kompetencje społeczeństwa”, działanie nr 3.2 „Innowacyjne rozwiązania na rzecz aktywizacji cyfrowej”.
Tytuł projektu: „Akademia Innowacyjnych Zastosowań Technologii Cyfrowych (AI Tech)”.