Digital Twin Office for Workspace Throughput Monitoring

Leveraging intelligent devices to provide smart office solutions

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ABSTRACT

Efficient usage of spaces and tools in a workspace is crucial when maximizing throughput in an input-process-output environment.

Current work shows an integrative DT of a shared workspace with an IoT infrastructure via a three-module integrative system's design and real-time implementation.

Modules consist of: Orders reported by employees on Bitrix24, a CRM; machine's state and operations done according to Q-lab, an API; employees' actions captured by CCTV cameras, processed via a CV algorithm with a DL model that follows the architecture of a CNN.

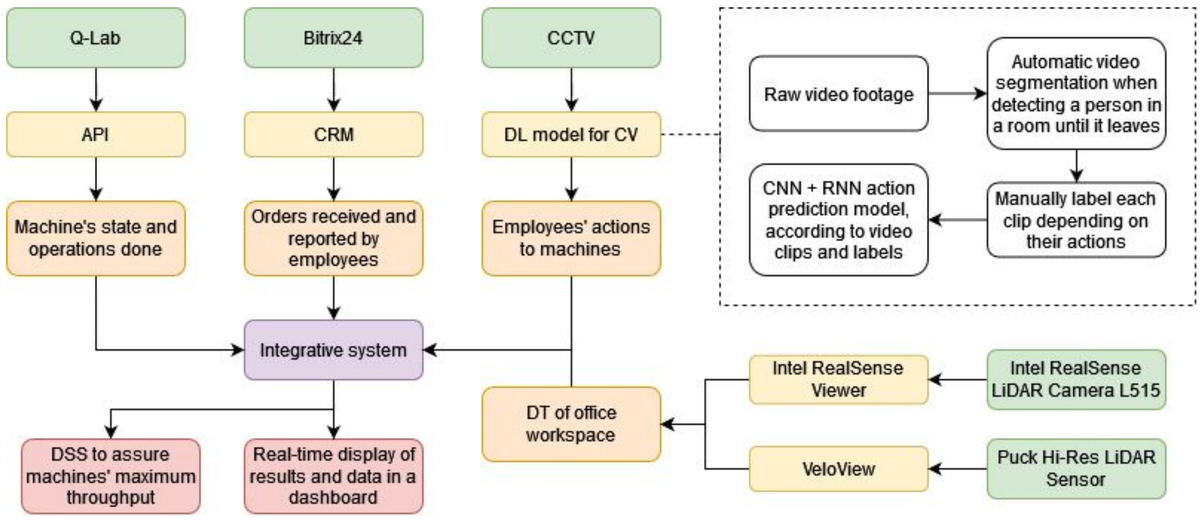
As a result, a real-time dashboard deliver a DSS: Shows the machines in terms of usage, time of operation remaining, conflicts between data sources, and employee actions.

INTRODUCTION

Human Action Recognition (HAR) may be either [1]: **Sensor-based** (gyroscope, pressure sensors, depth) [2] or **vision-based** (RBG, RBG-D) [3], vision-based approaches using DL and long CCTV recordings **predict abnormalities** with high accuracy [4].

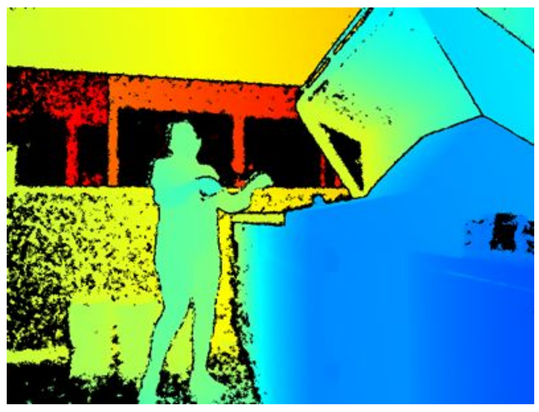
METHODOLOGY

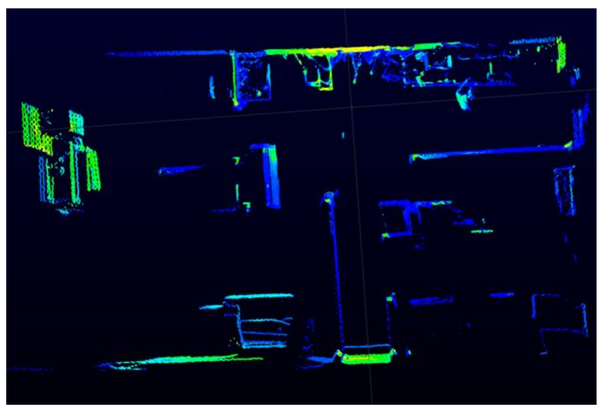
Based on CCTV footage, Bitrix24, Q-lab, as well as Intel® Realsense™ LiDAR Camera L515, and Puck Hi-Res Velodyne® LiDAR Sensor, create a DSS to assure machines' maximum throughput through a real-time DT dashboard visualization.



RESULTS

Depth analysis of employees' actions using Intel® Realsense™ LiDAR L515, additionally, 3D DT of the working lab reconstructed by cautiously moving the shelf with Puck Hi-Res Velodyne® LiDAR and recording point clouds via VeloView.





CONCLUSION

Through a well-defined and automatized methodology, model training would require little human intervention to generate a well-structured dataset in order to predict HAR, leveraging video auto-segmentation using CV on CCTV footage.

An integrative DT framework of IoT devices and tools to track actions done in machines inside an input-process-output workspace environment; would act as a DSS to follow resources' state by leveraging intelligent devices interconnection.

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