Emergency Detection and Response System for Vacuum Robots

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Inspired by: Connected Healthcare prof. Dr. Bert Arnrich
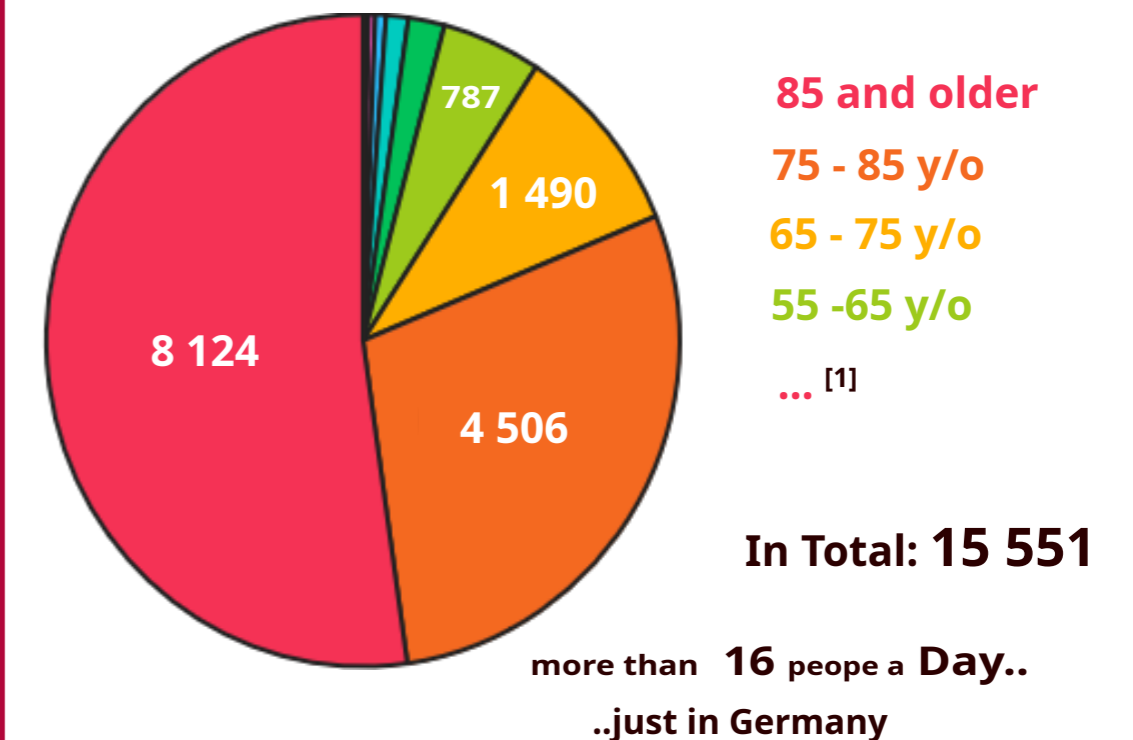
The Problem

Falls are a common cause of injury,
especially for older people,
or people with certain medical conditions.

Many people who fall are unable to reach a telephone or ask someone for help.

Numbers

Household Accident Fatalities by Age Group in 2022

- 787 — 55 -65 y/o
- 1 490 — 65 - 75 y/o
- 4 506 — 75 - 85 y/o
- 8 124 — 85 and older
- ... [1]

85 and older
75 - 85 y/o
65 - 75 y/o
55 -65 y/o
... [1]

In Total: 15 551

more than **16** peope a Day..
..just in Germany

The Idea

The goal of this project is to extend
the functionality of robot vacuum cleaners by

» open source **add-on**
to
» **recognize** when a person has fallen
and/or
»needs **emergency** assistance
so
» an emergency call can be sent **automatically**
or
» a trusted person can receive live video footage

Capabilities

Built-in Sensors:

3D camera

"to share real time video by streaming to
your mobile phone" [2]

LiDAR sensors

"create accurate room maps for the Jet Bot to
navigate so no worrying about your robotic
vacuum going to places it shouldn't"[2]

Approach

The research question is to use the **existing sensors** of a robot vacuum cleaner and develop a **model** using machine learning that **recognizes human outlines** in all possible positions in order to automatically make an **emergency call** if necessary.

» Sensor Analysis and Enhancement

» Integration and Testing

» Data Collection and Model Development

» Open-Source Cross-platform Compatibility

Sofa
Table
Socks
Dog bowl
Cable
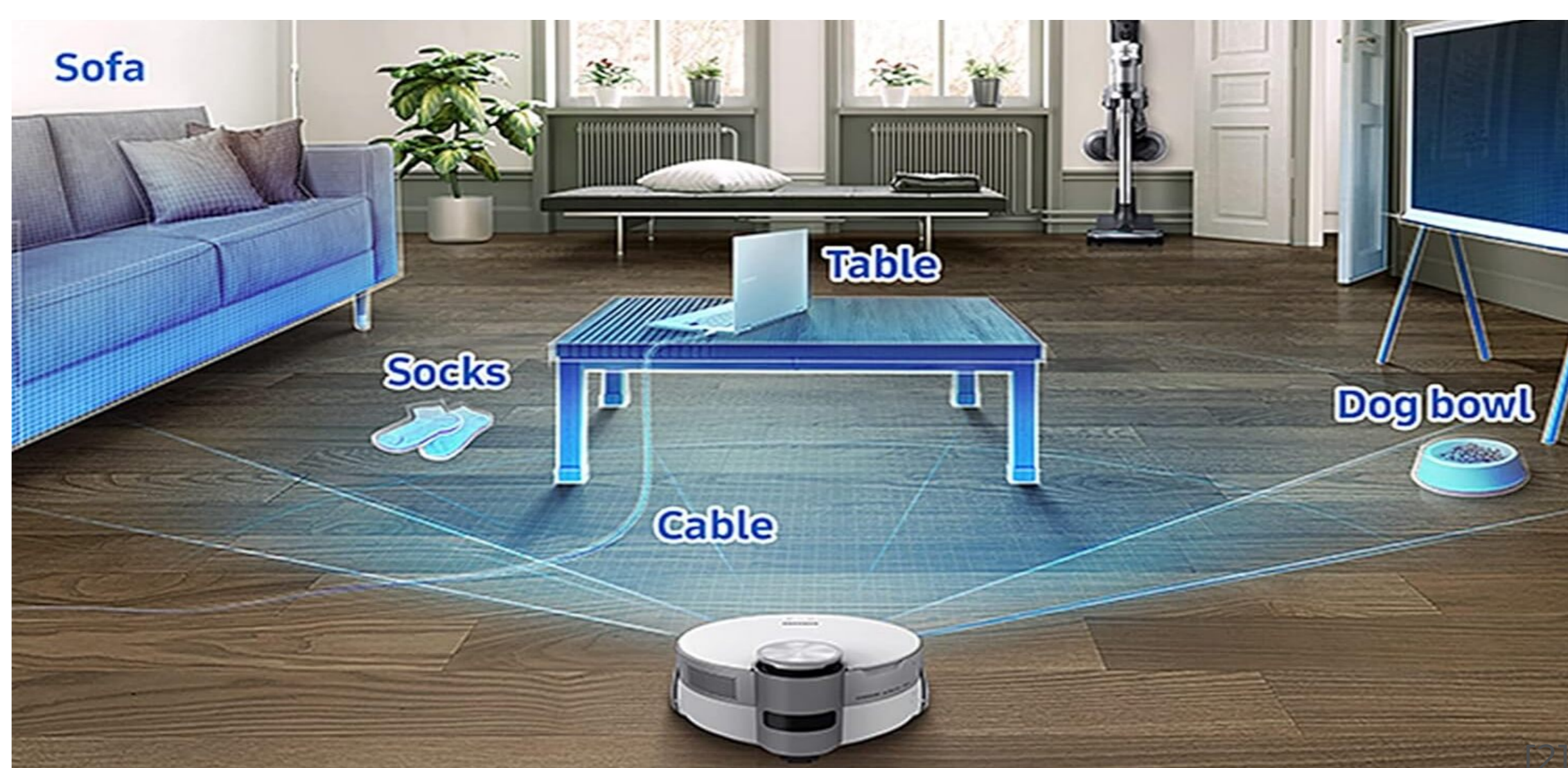
Abstract

This paper focuses on using the existing sensors of vacuum robots and using machine learning to develop a model that recognizes human outlines in different poses. Elderly people, but also people with certain medical conditions, especially if they live alone, are often unable to get up independently after a fall.
This paper describes the development of an open source, manufacturer-independent additional function for vacuum robots that can automatically make an emergency call in the event of an emergency situation.

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[1]:Statistisches Bundesamt. (2023). Anzahl der Gestorbenen nach Unfallkategorien. Abgerufen am 10. Juli 2024, von https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Gesundheit/Todesursachen/Tabellen/sterbefaelle-unfaelle.html

[2] Amazon. (2024). SAMSUNG Robot Vacuum with Object Recognition. Abgerufen am 10. Juli 2024, von https://www.amazon.com/SAMSUNG-Recognition-Intelligent-Touchless-Navigation/dp/B0912TLG7T