

**DICTIONARY LEARNING BASED SYSTEMS
FOR MONITORING ACTIVITIES OF DAILY
LIVING IN SMART HOMES**

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2022

ABSTRACT

In recent years, incredible development in medical science has resulted in an increase in average life expectancy and there is a demographic change in the ratio of the number of elderly people to those of working people in society. Due to this propensity, new challenges have been introduced from a social and economic standpoint in society, in providing a self-sufficient living for older age people. **AAL** technology provides a platform of solutions to such problems as monitoring different **ADLs**. Development of sensor(s) based, signal processing aided, low-cost ambient assisted living tools (**AAL**), essentially for assisting elderly people, home automation, and remote monitoring purposes, has become an important research domain.

The first part of this research work, **K-SVD** dictionary learning based **SRC** classifier is proposed to find the solution for a human behavior recognition problem in a home environment. Several modifications of **K-SVD** based dictionary learning are also proposed to improve the solutions.

The second stage of this research work deals with one of the most important research problems i.e., detection of human movement direction within the smart home environment. The work is involved in developing a sophisticated, low-cost, integrated hardware-software combined intelligent system for human movement detection problems. In this context, **MCP** /**novel variants of the MCP (MMCP)** algorithms are proposed in conjunction with the developed hardware module to detect the direction of human movement.

For further improvement in performance accuracy as it is a real time system, Regularization Concept based Dictionary Learning Scheme (i.e. **Regularised K-SVD (RK-SVD)** and **Regularised Approximated K-SVD (RAK-SVD)**) and their novel variants (i.e.

modified version of RK-SVD and RAK-SVD) are proposed for the detection of Human Movement Direction Problem utilizing the indigenously developed integrated setup.

In the final phase, the research work is involved to develop an intelligent surveillance tool for intruder detection problems. A novel dictionary learning based approach is proposed that merges the concepts of **LC** with **MCASDL**, named as **label consistency based modified consistent adaptive sequential dictionary learning (LC-MCAS-DL)** algorithm, in conjunction with the four PIR sensor based hardware setup to develop an intruder detection system.