

# From Labs To Lifestyles: How Technology Transfer Shapes Our World

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Editor: Dr. İsmail ÇETİN



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**FROM LABS TO LIFESTYLES: HOW TECHNOLOGY TRANSFER SHAPES OUR  
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## PREFACE

The pace of technological change has reached an unprecedented level and holds the potential to profoundly transform our daily lives, economy, and society. While the journey from groundbreaking research in labs to the development of products, services, and solutions that shape our lifestyle is complex, it is also powerful and impactful. *From Labs to Lifestyles: How Technology Transfer Shapes Our World* examines how technology is transferred from laboratories to our lifestyles and how this process shapes our world.

Technology transfer is a bridge that converts scientific discoveries into practical applications. It allows innovations that emerge in academic, governmental, or private-sector labs to be transformed into products, services, and applications that respond to societal needs and enhance the quality of life. It is a powerful engine that enables progress and innovation across every sector, from life-saving medical treatments to everyday digital tools.

However, technology transfer is not a simple and linear process. It is much more than the mere transfer of an idea from one place to another. It is a dynamic and often complex process that requires collaboration among researchers, entrepreneurs, businesses, governments, and other stakeholders. It demands not only technical knowledge but also a deep understanding of markets, intellectual property, commercialization strategies, and regulatory frameworks. Most importantly, it requires a vision of how science and technology can be used on a global scale to improve lives.

This book provides an in-depth exploration of the processes, challenges, and success stories of technology transfer. It addresses how scientific knowledge is transformed into innovations that impact every aspect of our lifestyle. We will also cover the stories of technologies that successfully made the transition from lab to life, as well as innovations that failed to do so. Furthermore, through case studies, expert opinions, and real-world examples, we will explore how technology transfer can be successfully executed.

As the world becomes increasingly interconnected, the effective transfer of technology and knowledge has become more critical than ever. Understanding the processes and strategies behind technology transfer will not only help innovators but also enable the creation of a world where technological progress benefits all societies.

This book is for anyone interested in the intersection of science, technology, and society. Whether you are a researcher, business leader, policymaker, or simply curious about how these processes work, *From Labs to Lifestyles: How Technology Transfer Shapes Our World* will help you deeply understand the vital role of technology transfer and its importance in shaping our world.

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# CHAPTER 1

## AUTOMATIC DETECTION OF POSTURE AND MOVEMENT POSITIONS OF PATIENTS AT RISK OF FALLING

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### **ABSTRACT**

The number of elderly people in the world population appears to be increasing significantly. This has a significant negative impact on healthcare and emergency services. Most elderly people want to grow old in their own homes and live alone. Many of them may experience some abnormal conditions such as chest pain and headache due to aging. Because they live alone, these abnormal activities cannot be noticed and can cause serious health problems and even death. Therefore, a monitoring system is needed to monitor person behavior and alert caregivers. The main purpose of this study is to develop a system that allows sensitive and automatic detection and monitoring of posture and movement positions in individuals at risk of falling. Through automatic detection of posture and movement positions, the overarching goal is to proactively identify potential hazards, including falls, improper positioning or prolonged immobility. This proactive approach aims to generate timely alerts and notifications to quickly inform paramedics or medical doctors, thus facilitating rapid interventions and reducing the risk of accidents or complications. In the study, the data transferred from the IMU sensor on the patient to the Raspberry Pi is evaluated with the software. When sudden changes occur from the values determined as normal posture levels, the patient's new posture position is determined and the perception of falling is created. Regarding this situation, the type of fall that occurs is also determined with various variations.

**Keywords:** Elderly people, fall and posture detection, IMU sensor, Raspberry Pi, remote patient monitoring

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## 1. INTRODUCTION

In older ages, mobility is affected and falls occur more frequently. Such health risks for the elderly are alarming for public health. This situation causes injuries and even deaths [1]. Nowadays, the number of older people living alone is increasing, with all the risks involved. Perhaps the biggest threat they face is that there is no one around to help them. Falls are one of the leading causes of injuries in older individuals[2]. Nowadays, the number of elderly people living alone is increasing, with great risks. In particular, the rate of fall accidents and fall-related hospitalizations is increasing every year [3]. Falls in older age often lead to bone and hip fractures, making it impossible for these people to stand up in addition to their reduced mobility. If the person loses consciousness after a fall, this may worsen and become uncontactable for help via a mobile phone or similar device [4]. Additionally, special devices are needed to track the location and status of Dementia or Dementia patients while traveling outside the home [5]. Falls in diseases such as Parkinson's disease and epilepsy; It causes injuries, bone fractures and even death [6]. Falls; It is an important problem for the elderly, who are a vulnerable segment of the population and live alone. Most of the time, they cannot ask for help, which leads to very dangerous consequences [7]. The response time required to treat critically injured victims in such fall cases is crucial for the survival of the victims [8]. Approximately one-third of people over 65 who live alone fall each year. Falling and the fear of falling are one of the most important health risks that affect the quality of life of the elderly and threaten their independent lives [9].

Many observation systems are currently available to detect falls, but a system with optimal efficiency is desperately needed [10]. The biggest threat faced by elderly living independently is falling accidents. Robust, reliable and unobtrusive fall detection systems are needed to counter the threat [11]. The number of fall detection systems has increased significantly in recent years [12]. Different methods have been developed to solve this problem, but some of them have brought problems. For example, while some video surveillance solutions violate privacy, mobile phone-based ones expect the user to go everywhere with a phone [4]. An automated system that detects a fall and the person's identity and reports it to emergency services could help save lives. With identification, they will know not only when to help, but also who to help [7]. Accurate and reliable automatic fall detection based on wearable devices enables elderly people to receive rapid treatment. Thus, it can alleviate the consequences of serious falls [13]. Therefore, a low-cost inertial sensor-based system is a tool that will meet the need for fall detection in the elderly [1]. Fall detection also attracts attention for public interest