1. Introduction

1.1. Objective

The main objective is to improve labor shortage conditions through robot arms automation. Automation in production using industrial robots and AI is a practical way to increase worker productivity and continue to satisfy demand with fewer personnel. Through automation experienced human employees are enabled to leverage their inherent knowledge of best practices for production automation to assist the manufacturing plant well beyond routine or repetitive tasks. According to Deloitte's 2018 Global Human Capital Trends report, 47% of manufacturers are already supplementing their current workforce with automation, with 24% using AI and robotics to perform routine tasks and 16% using automation to augment human skills. (Kel Guerin, PhD, 2022)

A safer factory environment for all employees can result from the use of industrial robots for tasks that were previously difficult or even dangerous for humans. Repetitive movements, improper lifting techniques, and poor posture can all result in injuries, which can result in missed work and workers' compensation claims. Utilizing automation and material handling techniques widely could significantly lower those figures. (Newton, 2022) Industrial robots could help improve the labor shortage condition, more industries have come to understand the advantages of robotic automation, and articulated robots are now used in a wide variety of industries. Industrial robots are extremely precise, they can avoid errors by repeatedly performing the exact same actions and tasks. Besides, Industrial robots can also reduce costs and maintain work efficiency due to mistakes, bad time management, mishaps, a lack of workers, or low productivity, projects frequently take longer than anticipated. All these problems are resolved by factory robots. (Robots Done Right, n.d.)

1.2. Problem Statement

Nowadays, the world emphasizes labor efficiency and cost in the workplace, including labor in the manufacturing industry. Labor shortages will directly impact local,

regional, and global supply chains. According to the NSTP report mention despite the local economy recovering after the pandemic, the local construction industry has been negatively impacted by a labor shortage, rising raw material costs, rising interest rates, and a lower ringgit. (NSTP, 2022) There is a labor shortage in a particular industry or area, meaning that there are not enough workers available to perform the necessary tasks, and also have become a significant challenge for many industries and regions, with the demand for workers exceeding the available supply. The problem has been exacerbated by demographic and economic trends such as population aging, declining birth rates, and changes in the nature of work. When the manufacturing industry is facing a severe labor shortage will cause production slowdowns impacting production and increasing costs, leading to delays in delivery times and reducing profitability for companies, and also will affect the logistics industry because the shortage of available labor directly impacts the ability to move goods between parties. (Inbound Logistics, 2022) resulting in inventory stock-outs for distributors and retailers. According to Tan Sri Soh Thian Lai, president of the Federation of Malaysia Manufacturers (FMM) a labor shortage prevented Malaysia's manufacturing sector from ramping up production to meet the demand globally and increase export trade volumes, which is estimated to have cost the country's manufacturing sector RM50 billion in the first eight months of the year. (Beatty, 2022) During the pandemic time, the manufacturing industry they facing a labor shortage, and also manufacturing jobs were viewed as a dead end it is because people entering a technology-dominated workforce do not perceive manufacturing as a viable career path.

1.3. Advantages & Contributions

1.3.1. Increased productivity

Robot arm can work at high speeds with consistent precision and can work around the clock without needing breaks, which means the manufacturing process can be carried out without interruption leading to increased productivity and output while reducing production time and faster time-to-market.

1.3.2. Enhanced worker safety

Robot arm can be used to perform tasks that are too dangerous or hazardous for human workers, such as working with heavy machinery or in environments with toxic or flammable materials, reducing the risk of worker injury. In addition, robot arms taking on dangerous or repetitive tasks can help improve working conditions for people workers, reducing the risk of injury and improving job satisfaction.

1.3.3. Cost savings

When the robot arm completed the setup, it can work around the clock without needing breaks with minimal maintenance, also no need for the staff's overtime work lead to reduce labor costs. In addition, the robot arms can perform tasks with consistent precision resulting in reducing the risk of errors and defects, and also robot arms can help reduce material waste, which can be a significant cost in manufacturing.

1.3.4. Automation Detection and Recognition

The robot arm can through a camera detect and recognize specific objects for grabbing and placing the object in a specified position.

1.4. Project Plan

1.4.1. Milestone

Phase	Milestone Goal	Deadline
Planning	Draft proposal submission	10/1/2023
Analysis	Introduction	24/2/2023
	Research Background	10/3/2023
	Methodology and Requirements Analysis	31/3/2023
Design	Design the six-axis robot arms and prepare the required component.	10/4/2023
Develop	Build up the robot arms	1/5/2023
Integrate the hardware and software	Integrate the hardware and software components and test the overall system.	15/5/2023
Maintain and update	Adjustment accuracy and maintenance	5/6/2023

1.5. Chapter Summary and Evaluation

The robot arm is developed to improve the labor shortage conditions, especially the particular industry or area might facing problems caused by labor shortage including impacting production and increasing costs. The manufacturing industry can be said to be an industry that is greatly affected by labor shortages will cause production slowdowns impacting production and increase costs reducing profitability for companies. Using industrial robots to perform tasks that are dangerous to humans can lead to a safer factory environment for all employees. In addition, automation in production using industrial robots saves costs it just needs a minimum maintenance fee to achieve increased worker productivity and reduces the chance of error, and also no need for staff to work overtime.

Reference

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