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ROBOT CONTROLLED ARTIFICIAL INTELLIGENCE CONFIGURATION SYSTEM AND AUTOMATIC PROCESS IMPLEMENTATION

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ABSTRACT

In this paper we are focusing on the Automatic process implementation of system using Artificial Intelligence Configuration in KUKA robot. Working system operation improvements and input output data and lay outing root controlled controller are also under observation. In this paper we are working only on KUKA KR16 but this idea can be implemented on any industrial robot. The controller will automatically configure the system bus of the industrial robot. . Under machine configuration system channel with Artificial Intelligence is provided by automatic joint functional behavior & controllability & observability function. We know that KUKA robot is a universal robot because the systematic channel of process implementation is very high reliability function and medium level lay outing pattern system for machine controlled implementation. Using this behavior, system is finding a very high change related to cycle time reducing and Automatic Process Implementation in KUKA industrial robot.

Keywords: *Industrial Robot, Automatic Tracking, Automatic Implementation, Artificial Intelligence*.

I. INTRODUCTION

The goal of automation is to increase the reliability and quality of a given process. The objective is to make the Robot independent to take the decision by itself. The robot shall be able to understand it with the little change in hardware software and programming. Robotics automation has been gained by combination of various means like pneumatic, hydraulic, electrical, mechanical, electronic and computers. Automatic control is the application of various control systems for operating equipment such as industrial robot, advantage of automation is that it saves labor but it is also used to save time and materials and to improve accuracy, quality and precision. It is replacing humans in tasks done in dangerous environments and also in performing tasks that are beyond human capabilities of size, weight, speed, endurance, etc. Under advance configuration, World's latest and advance

Robot Controller KR C4 system channel Implementation with Artificial Intelligence is provided by automatic joint functional controllability, behavior & observability function. In robotics the systematic channel of process implementation is very high reliability functions and medium level lay outing pattern system for machine controlled implementation. Using this behavior, system is finding very high changes related to cycle time reducing and Automatic Process Implementation in industrial robot.

II. ARTIFICIAL INTELLIGENCE

AI was invent by John McCarthy in 1956 he was an American computer scientist, at Dartmouth Conference. Now, it is an umbrella term that encompasses whole thing from robotic process automation to actual robotics. It is an area of computer science. It's a vision on the creation of intelligent machines that can work and having its own processing capability. Artificial Intelligence provide power to a machine to copy intelligent human behavior that it can able to take an action in response to varying situations bases on past experience.

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There are basically 3 elements which are as follows-
1- Sense
2- Plan
3- Act

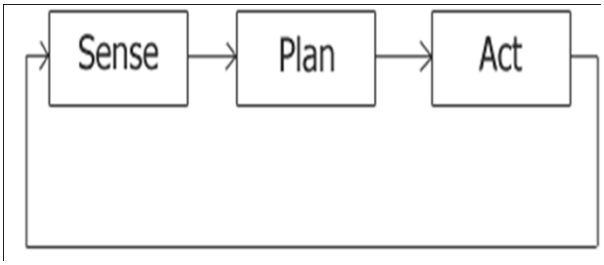

Figure 1 Element in Artificial Intelligence

ROBOT PRIMITIVES	INPUT	OUTPUT
SENSE	Sensor data	Sensed information
PLAN	Information (sensed and/or cognitive)	Directives
ACT	Sensed information or directives	Actuator commands

Artificial intelligence is the simulation or process of human intelligence based processes by the machine that is action of pretending, especially by the computer systems. These processes need lots of learning, means the obtained data of information and set of rules for using the information, reasoning (in a sensible way), and self-correction. Particular applications of Artificial intelligence needed expert systems, machine vision and also speech recognition.

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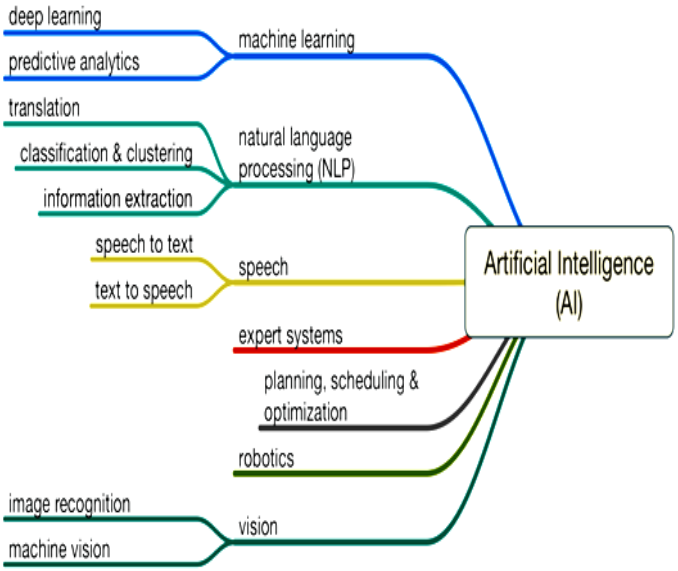

Figure 2 Artificial Intelligence

Areas of Artificial Intelligence-

1. Knowledge Representation
2. Understanding natural language
3. Learning
4. Planning and Problem solving
5. Inference
6. Search
7. Vision

III. INDUSTRIAL ROBOT & ITS COMPONENT

Industrial robot is an automatically controlled robot which is multipurpose, reprogrammable, manipulator and also which have three or more axes. It can be either fixed in place or mobile for use in industrial automation applications. Industrial robots are used as transporting devices such as material handling of work pieces between machines or in some kind of process like painting, welding, assembly, or manufacturing process. Also the industrial robot controller has good capability of I/O communication and often acts as cell controller in a typical set-up of a flexible manufacturing cell or system.

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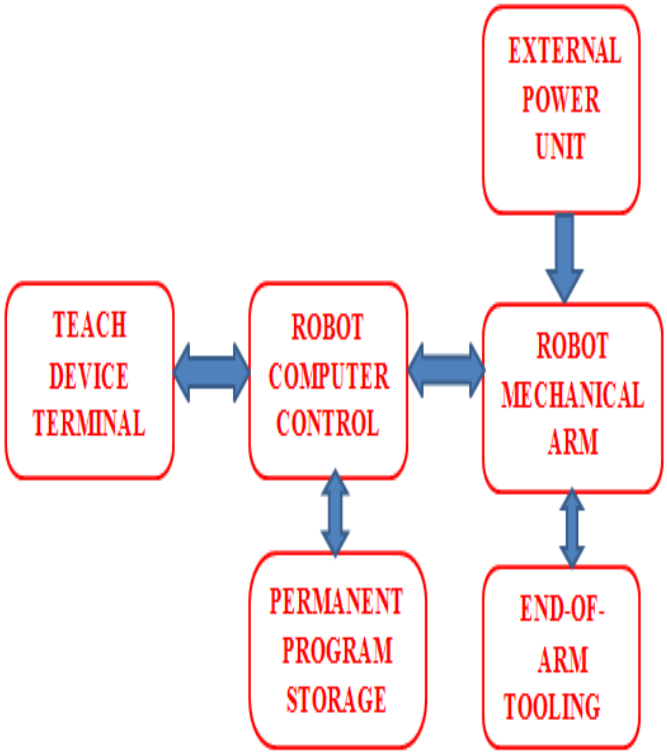

Figure 3 Block diagram of Robot

A robot is a programmable machine by which computer capable of carrying out a consisting of many different series of actions automatically.

A robot system that consists of three parts:

1. Manipulator (robot arm)
2. Controller (KRC4)
3. Teach pendant (KUKA smart PAD)

Description of the industrial robot
The industrial robot consists of the following components:

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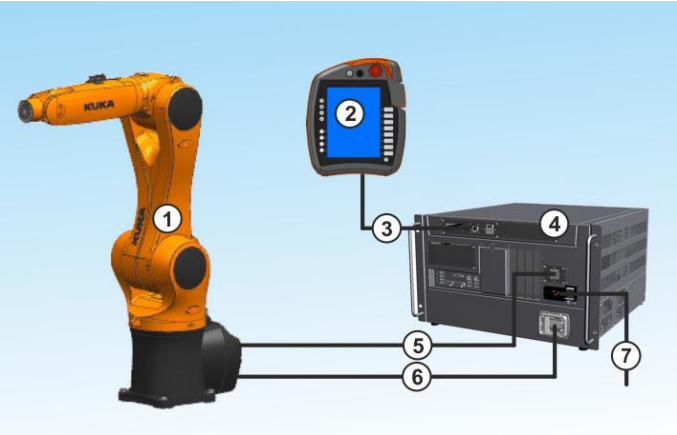

Figure 4 Components of Robot System

1. Manipulator
2. Control panel
3. Connecting cable for smart PAD
4. Robot Controller
5. Connecting cable, data cable
6. Connecting cable, motor cable
7. Device connection cab

Manipulator
This is the main body of the robot which consists of the links, the joints, and other structural elements of the robot.

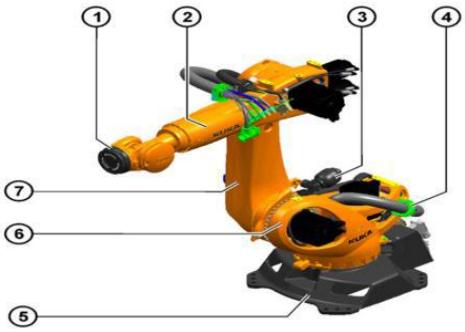

Figure 5 Components of Manipulator

1. In-line wrist
2. Arm
3. .Counterbalancing system
4. Electrical installation
5. Base frame
6. .Rotating column
7. .Link arm

The counterbalancing system is installed between the rotating column and the link arm and serves to minimize the moments generated about axis 2 when the robot is in motion and at rest. A closed, hydro pneumatic system is used. The electrical installation means all the motor that can control by the cables for motors of axes 1 to 6. All connections are made as connectors so enable the motors can be exchanged quickly and reliably.

Overview of robot controller (krc4)

In the automation kr c4 controller is best suited for present and futre application. This controller minimizes costs in integration, maintenance and servicing. This also increases long-term efficiency and flexibility of the system. The kr c4 software architecture integrates robot control, plc control, motion control (e.g. Kuka.cnc) and safety control. All controllers share a database and infrastructure. This makes automation simpler and more powerful both now and in the future. In this project we are introducing artificial intelligence in the hyper input configuration, so robot can decide different tasks to perform automatically and so production rate and quality both will improved.

The robot controller consists of the following components:

- Control PC (KPC)
- Low-voltage power supply unit
- KUKA Power Pack (KPP)
- KUKA Servo Pack (KSP)
- Cabinet Control Unit (CCU)
- Controller System Panel (CSP)
- Safety Interface Board (SIB)
- Batteries
- Fans

Figure 6.1 KUKA KR C4 Controller

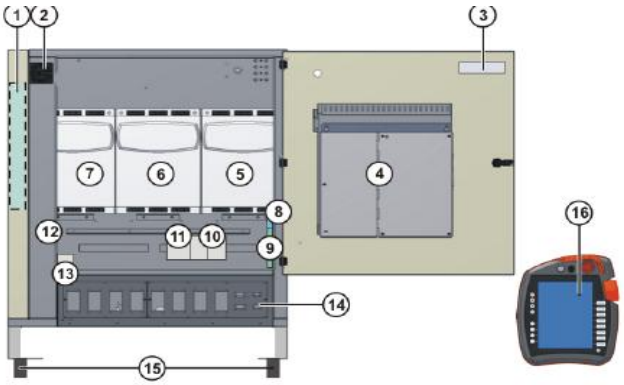

Figure 6.2 Controller Components

1. Mains filter
2. Main switch
3. CSP
4. Control PC
5. Drive power supply(drive controller for axes 7 and 8, optional)
6. Drive controller for axes 4 to 6

7. Drive controller foe axes 1 to 3
8. Brake filter
9. CCU
10. Contactors
11. Switch
12. Fuse element
13. Batteries
14. Connection panel
15. Housing
16. KUKA smartPAD

KUKA Smart Pad Teach Pendant

The KUKA smart pad can operate with all KUKA robots and KR C4 controllers. It makes operating robots simple as it has simple operator controllers with jog keys and 6-D mouse. It features well -lit 8.4 screen with an intuitive user interface and user friendly design. It has a light weight for extra comfort and provides direct saving and loading configurations via the USB port. And also 6D mouse and on board USB port gives new directions to interact with a teach pendant. The smart PAD also have a large touch screen display with including keys.

Figure 7 KUKA Smart PAD

The teach pendent is the main part of industrial robot. It is also called the HMI (human machine interface). The smart PAD has all the operator control and display functions required for operating and programming the industrial robot.

The smart PAD has a touch screen and it can be operated with a finite or stylus. An external keyboard is not necessary. The smart PAD is also termed as KCP (KUKA Control Panel). The signals flow from HMI to the controller and robot through etherCAT. With the help of HMI user monitors and controls the robot. In this project we are mainly working on the KUKA system bus so we can transmit signals in bulk resulting high speed.

There is an enabling switch in HMI. The enabling switch has 3 positions:

- Not pressed
- Center position
- Panic position

The enabling switch must be held in the center position in operating mode T1 and T2 in order to be able to jog the manipulator. In the operating modes that is Automatic and Automatic External, after enabling the switch it has no function. Controller communicates with the user operator via the message window.

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IV. PROPOSED MODEL

The Cabinet Control Unit is the central power distributor and communication interface for all components of the robot controller. The CCU basically consists of the Cabinet Interface Board (CIB) and the Power Management Board (PMB). All data transferring can be done via this internal communication interface to the controller for further processing. If in case mains voltage fails, then a control components continue to give powered by batteries until the position data are saved by the system and then controller has shut down.

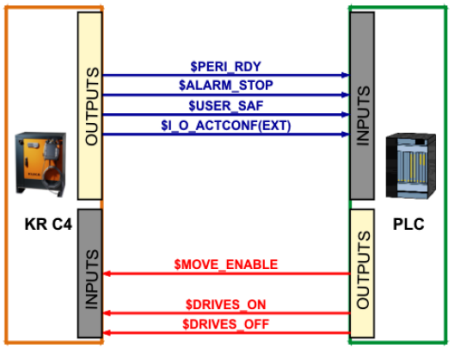

Figure 8 Proposed Model 1

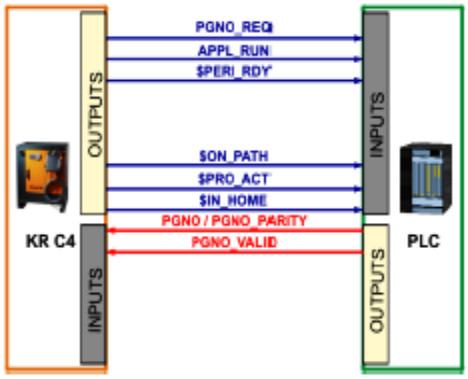

Figure 9 Proposed Model 2

V. CONCLUSION

The main advantage of this paper is to reduce time cycle which will ultimately led to increase in productivity. It will replace humans in tasks done in dangerous environments and to perform tasks that are beyond human capabilities of size, weight, speed, endurance, etc. To increasing productivity of the system or increased predictability of quality or to improving quality, it required improved robustness of the product, it increasing consistency of output due to that it reduced direct human labor costs and expenses.

It is also used to save energy and materials and to improve quality, accuracy and precision.
KUKA Laboratories develops practical key technologies for the growth markets of the future. With a research and development focus in the core areas of service and medical robotics, a safe human-machine interaction, compliant and sensitive handling, intelligent sensor systems, mobility, and simple and intuitive operator control are achieved.

A new era is dawning, and they are developing pioneering technologies and high-tech products in the fields of service and medical robotics for global markets. Within the foreseeable future, this is set to change the world as profoundly as the invention of the Internet. With intelligently operating machines that interact with humans, assist us, entertain us and serve us untiringly.

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