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AUTOMATIC SYSTEM BUS IMPLEMENTATION FOR HYPER INPUT CONFIGURATION

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ABSTRACT

As project name **"AUTOMATIC SYSTEM BUS IMPLEMENTATION FOR HYPER INPUT CONFIGURATION"** suggests that it introduces a new system of accelerating the pace of progress in intelligent robotics by the means of competition of high scientific standard and to maintain high standard of layouting from the point of view of industry.

The basic need of this project is higher production with minimal usage of time duration, so that lead time can be reduced to a larger extent.

In this project we are working on the system bus. With the help of system bus we introduce a large number of signals at a time. The group of signals is transferred from source to destination where a variety of tasks are performed. We are highly concerned with the safety of the operation to be performed, this paper will also describe briefly about the safety of robot and the operator. To reduce the man power, a system is created which will be automatically configured to the desired output.

We are introducing artificial intelligence in hyper input configuration system, so robot automatically can make decisions according to working environment. After the implementation of automatic system bus with artificial intelligence we can easily reduce the lead time. The idea behind automation is to reduce the number of terminals required. EtherCAT only requires a single computer to operate. All field buses are eliminated. EtherCAT is new technology, it has transformed production processes.

Keywords: *Artificial Intelligence, Hyper Input Configuration, Implementation, System Bus*

I. INTRODUCTION

Due to increase in population, product diversity and variants requirements is increased, so it is necessary to enhance manufacturing productivity and flexibility in order to maintain or increase competitiveness. For this purpose applications of robots in industry have been increased to fulfill present requirements. Whenever repetitive tasks are to be performed robots should be used because they provide better accuracy with minimum lead time and thus provide higher production rate and better quality. A robot is a programmable, multifunctional manipulator designed to move material, parts or specialized devices through variable programmed motions for the performance of a variety of tasks (RIA). A robot system mainly consists of three parts:

Controller (KRC4)
Manipulator (robot arm)
Teach pendant (KUKA smartPAD)

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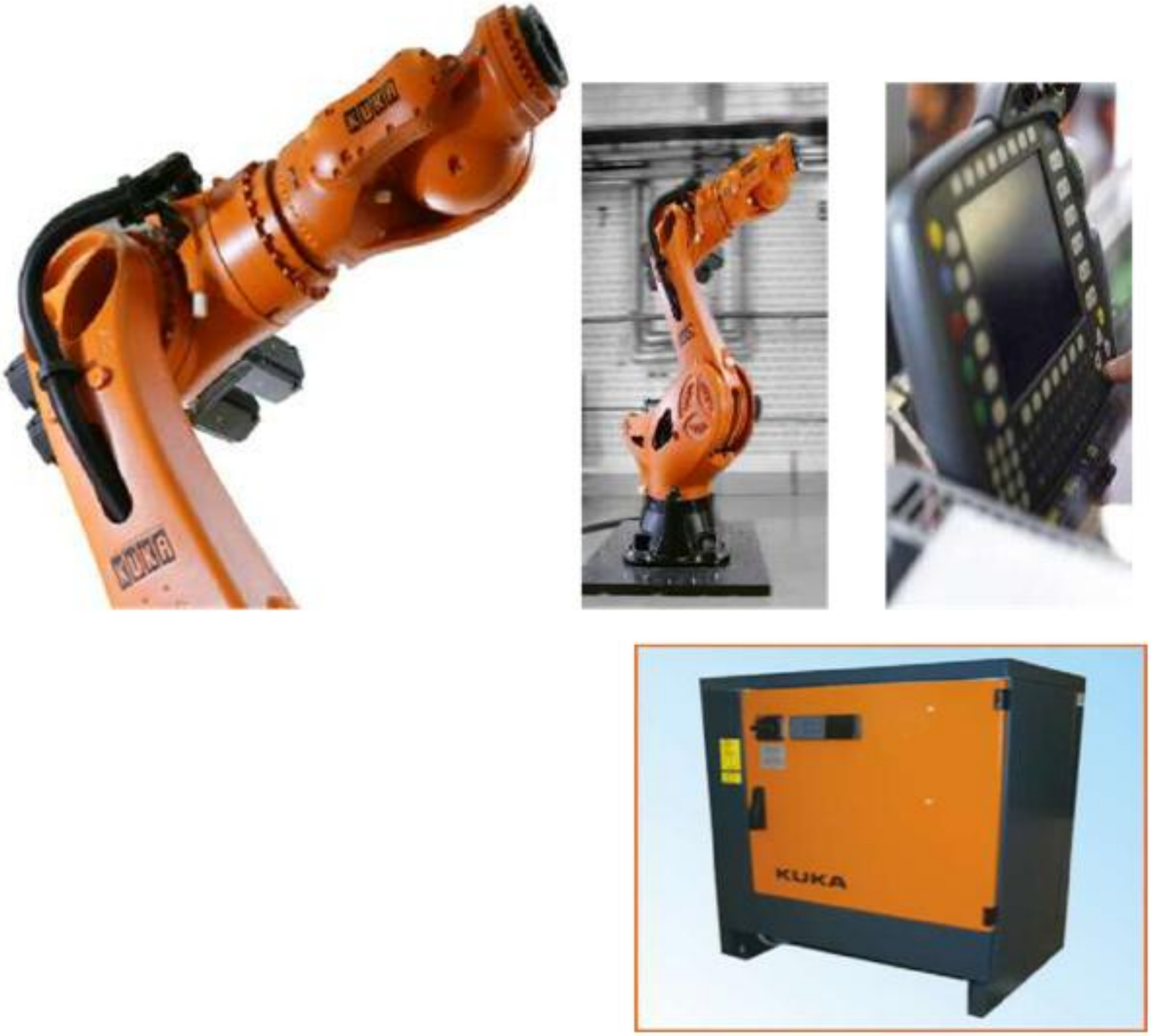

Fig 1 Components of robot system

II. 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)

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- KUKA Servo Pack (KSP)
- Cabinet Control Unit (CCU)
- Controller System Panel (CSP)
- Safety Interface Board (SIB)
- Batteries
- Fans

Fig 2 Controller

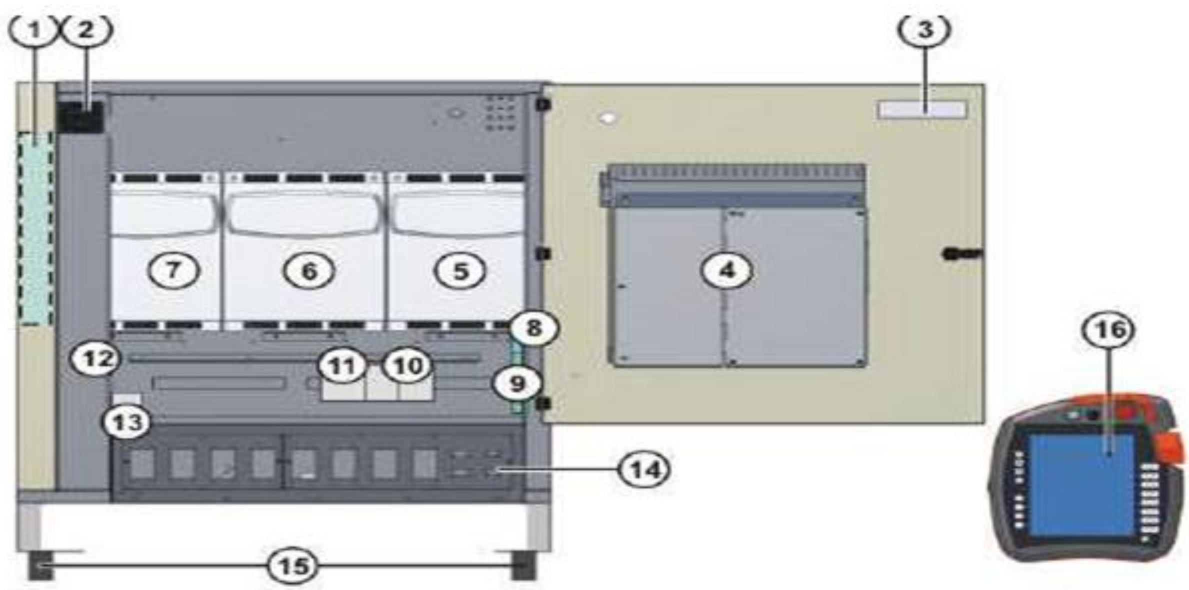

Fig 3 Controller Components

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

III. MANIPULATOR

Fig 4 Components of Manipulator

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

This is the main body of the robot which consists of the links, the joints, and other structural elements of the robot. 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 installations include all the motor and control cables for the motors of axes 1 to 6. All connections are made as connectors so enable the motors can be exchanged quickly and reliably.

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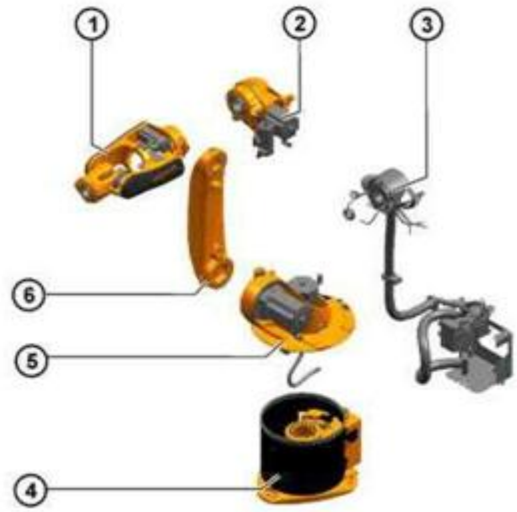

Fig 5 Assemblies of Manipulator

IV. TEACH PENDENT (KUKA SmartPAD)

Fig 6 Teach pendent

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

The smartPAD has a touch screen and it can be operated with a finite or stylus. An external keyboard is not necessary. The smartPAD 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 centre position in operating mode T1 and T2 in order to be able to jog the manipulator. In the operating modes Automatic and Automatic External, the enabling swtich has no fuction. The controller communicates with the operator via the message window.

V. KUKA SYSTEM BUS

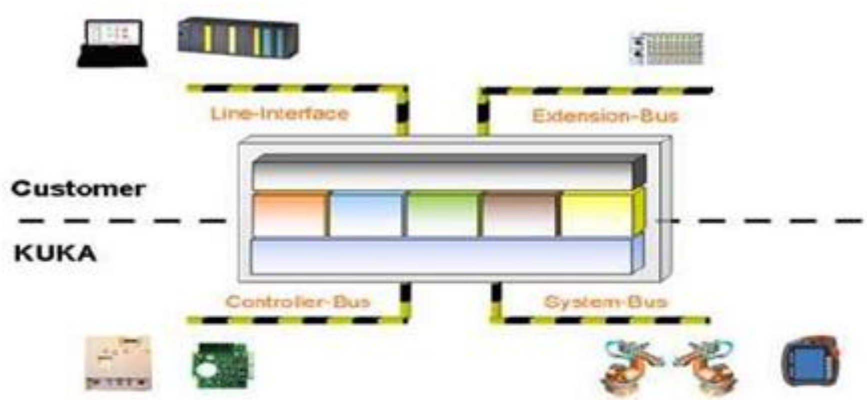

Fig 7 KR C4 bus system

KCB (KUKA Controller Bus)- Drive circuit devices are connected with KCB such as

1. RDC (Resolver Digital Converter)
2. KPP (KUKA Power Pack)
3. KSP (KUKA Servo Pack)
4. EMD (Electronic Mastering Device)

KSB (KUKA System Bus)- Following parts are connected with KSB

1. smartPAD
2. SIB (Safety Interface Board)
3. Extended SIB
4. Robo Team
5. Other KUKA options

KEB (KUKA Extension Bus)- Following parts are connected with KEB

1. EtherCat I/Os
2. Gateway for PROFIBUS
3. Gateway for Device Net

KLI (KUKA Line Interface)- Connection of following is made with KLI

1. PLC

2. Field bus connection
   - PROFINET & PROFIsafe
   - EtherNet/IP & CIP safety
3. Network connection via TCP/IP
   - Archiving data
   - Diagnosis
   - VRP (Virtual Remote Pendant)
   - Etc.

In this project we are working on EtherCat because it requires only on control computer thus reduces number of terminals. We are mainly focusing on reduction of number of terminals because in automation if number of terminals are less then we can obtain tremendous speed.

VI. CONCLUSION

In this project we are working on the bus system of KUKA KR C4 controller. We will transmit signals in bulk and also introducing artificial intelligence in hyper input configuration system of controller. So controller will decide which signal should be processed first and due to bulk transmission of signals overall speed of the operation will increase. Thus this project can bring tremendous reduction in production time and improve product quality.

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