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A SYSTEMATIC CRITICAL OPTIMIZING INTEGRATION KINEMATIC ALGORITHM OF DIGITAL RTOS SYSTEM FOR KUKA KR16 ROBOT

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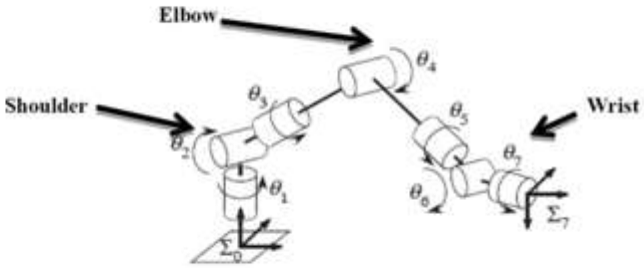
ABSTRACT

The problem of Critical system analysis and finding mathematical tools to represent industrial robot manipulators is to achieve desired position for rigid body motions in space. 6R is considered to be a well-researched with rooting and well-understood mathematical problem. Industrial Robotics, machine vision, computer graphics, and other Dynamics Engineering disciplines require co concise and efficient improve means of representing and applying fiberized coordinate motion kinematics transformations in six dimensions. Industrial robot manipulators or 6R Robotics requires systematic period of ways to represent the root based position or orientation of a Robotics Motion links and Robotics Motion External objects. This paper represents any mathematical Optimization algo which are capable of resolving any types of multidimensional motion can be implemented to solve the inverse or forward kinematic problem.

KEYWORDS: Critical System, mathematical tools, industrial robot, manipulators, 6R, Dynamics Engineering, Robotics Motion, External objects, mathematical Optimization, inverse kinematic, forward kinematic, RTOS, Optimizing Integration, Kinematic Algorithm, KUKA KR16 Robot etc.

I. INTRODUCTION

As per Robotics Institute of America (RIA), Association Francaise de Robotique (AFR) and Japanese Industrial Robot Association broadly classified in 6R diverse modules that are as follows:



A. Manual handling devices
B. Fixed sequence robot
C. Variable sequence robot
D. Playback robot
E. Numerical control robot
F. Intelligent robot

As per Intelligent robot figure the arm manipulator structure have 11 different degrees of freedom. The upper DOF with humeral bone can be assumed as a serial systematic mechanism and elbow joint with a humeral bone DOF that connects the ulna can be considered as a parallel systematic manipulator.

II. INTELLIGENT TECHNIQUES FOR INVERSE KINEMATIC SOLUTION

ANN models like MLP, PPN, Pi-NN, Ci-NN, Ki-NN, FNN, TNN etc. generally used to learn front joint angles of Industrial heavy robot manipulator and the data sets are generally generated through some important off

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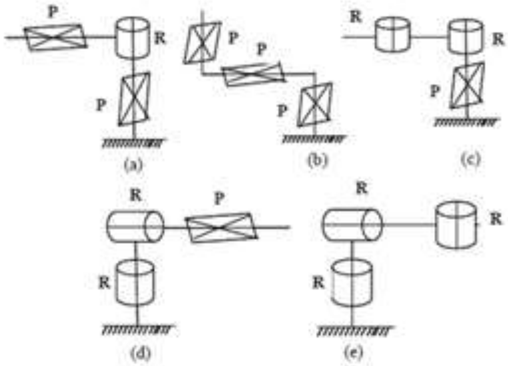
routed conventional methods like DH-algo, homogeneous transformation matrix, and algebraic methods etc. Forward kinematic equations are mostly used to train the neural network models for both forward and inverse kinematics equations are used to train the neural network models.

Different configurations				
RxRxRy	RxRxRx	RxPxRy	RxPyPx	PxRxPz
RxRxRz	RxRyPx	RxPxRz	RxPzPx	PxRyPy
RxRyRz	RxRyPy	RxPyRy	PxRxRx	PxPyRx
RxRyRy	RxRyPz	RxPyRz	PxRxRy	PxPyRy
RxRyRz	RxRzPx	RxPzRy	PxRxRx	PxPyPz
RxRzRx	RxRzPy	RxPzRz	PxRyRx	
RxRzRy	RxRzPz	RxPxPy	PxRyRz	
RxRzRz	RxPxRx	RxPxPz	PxRxPy	



III. INTEGRATED KINEMATICS RTOS PROGRAMMING

```
AUTOEXT GLOBALS
;=================================
; Structures:
;=================================
ENUMFUNCT_TYPE PGNO_GET,PGNO_ACKN,PGNO_FAULT
ENUMP00_COMMAND INIT_EXT,EXT_PGNO,CHK_HOME,EXT_ERR

STRUCSPS_PROG_TYPEINT PROG_NR,CHAR PROG_NAME[12]
;=================================
; External declarations:
;=================================
EXT  P00 (P00_COMMAND:IN,FUNCT_TYPE:IN,CHAR [],INT:IN )
;External declaration  for  Submit controlled AutoExt
EXT  P00_SUBM (P00_COMMAND:IN,FUNCT_TYPE:IN )

;=================================
; Variables:
;=================================
; Variables for internal
; Communication:
;--------------------------------
BOOL ERROR_FLAG
BOOL CHECK_HOME=TRUE
BOOL PROG_CONTROL=FALSE
DECLCHAR PRO_NAME1_L[8]
PRO_NAME1_L[]="       "
DECLCHAR PRO_NAME1_A[8]
PRO_NAME1_A[]="       "
```

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

```
INT PGNO=0 ;copy of ext. pgno
INT PGNO_ERROR=0 ;transmission error
INT PGNO_TYPE=1 ;coding type of ext. pgno
INT REFLECT_PROG_NR=0 ; enable mirroring of program number inputs (1=enabled, 0=disabled)

; Variables for External
; Communication: I/O-Interface
;----------------------------------
INT PGNO_FBIT=33 ;first bit of ext. pgno input $IN[]
INT PGNO_FBIT_REFL=999 ;first bit of ext. pgno reflection output $OUT[]
INT PGNO_LENGTH=8 ;length of ext. pgno (max. 16)
INT PGNO_PARITY=41 ;parity bit of ext. pgno
INT PGNO_REQ=33 ;request ext. pgno input
INT PGNO_VALID=42 ;validate ext. pgno input
INT APPL_RUN=34 ;application program is running output
INT ERR_TO_PLC=35 ;error output to PLC
INT P01_STEP
INT CHK_STEP
INT PGNO_FLAG

; Table for assign SPS program number to program name
INT MAX_SPS_PROG=12
DECLSPS_PROG_TYPE SPS_PROG[12]
SPS_PROG[1]={PROG_NR 1,PROG_NAME[] "HP01()    "}
SPS_PROG[2]={PROG_NR 2,PROG_NAME[] "HP02()    "}
SPS_PROG[3]={PROG_NR 3,PROG_NAME[] "HP03()    "}
SPS_PROG[4]={PROG_NR 4,PROG_NAME[] "HP04()    "}
SPS_PROG[5]={PROG_NR 5,PROG_NAME[] "HP05()    "}
SPS_PROG[6]={PROG_NR 6,PROG_NAME[] "HP06()    "}
SPS_PROG[7]={PROG_NR 7,PROG_NAME[] "HP07()    "}
SPS_PROG[8]={PROG_NR 8,PROG_NAME[] "HP08()    "}
SPS_PROG[9]={PROG_NR 9,PROG_NAME[] "HP09()    "}
SPS_PROG[10]={PROG_NR 10,PROG_NAME[] "HP10()    "}
SPS_PROG[11]={PROG_NR 62,PROG_NAME[] "HP62()    "}
SPS_PROG[12]={PROG_NR 63,PROG_NAME[] "HP63()    "}
DECLCHARTMPNAME[128]
TMPNAME[]="                    "
CHAR $V_R1MADA[32]
$V_R1MADA[]="V1.0.0/KUKA8.2";VERSIONSKENNUNG
INT $TECH_MAX=6 ;MAX. ANZAHL FUNKTIONSGENERATOREN
INT $NUM_AX=6 ;ACHSEN DES ROBOTERSYSTEMS
INT $AXIS_TYPE[12] ;ACHSENKENNUNG
$AXIS_TYPE[1]=3 ;1 = LINEAR, 3 = ROTATORISCH, 5 = ENDLOS
$AXIS_TYPE[2]=3
$AXIS_TYPE[3]=3
$AXIS_TYPE[4]=3
$AXIS_TYPE[5]=3
$AXIS_TYPE[6]=3
$AXIS_TYPE[7]=1
$AXIS_TYPE[8]=3
$AXIS_TYPE[9]=3
$AXIS_TYPE[10]=3
$AXIS_TYPE[11]=3
$AXIS_TYPE[12]=3
INT $POS_SWB[3] ;S-SCHALTBAR
$POS_SWB[1]=0 ;S-SCHALTBAR; UEBERKOPF (O = NEIN, 1 = JA)
$POS_SWB[2]=0 ;S-SCHALTBAR; ACHSE 2-3 (0 = NEIN, 1 = JA)
```

ISSN: 2277-9655
Impact Factor: 4.116
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```
$POS_SWB[3]=0 ;S-SCHALTBAR; ACHSE 5 (0 = NEIN, 1 = JA)
INT $SINGUL_POS[3] ;BEHANDLUNG UNDEFINIERTER GELENKSTELLUNGEN BEI VORGABE EINES SINGULAEREN PTP-PUNKTES
$SINGUL_POS[1]=0 ;BEHANDLUNG EINER UNDEFINIERTER GELENKSTELLUNG (0 = THETA=0, 1 = THETA=THETA ALT)
$SINGUL_POS[2]=0 ;BEHANDLUNG EINER UNDEFINIERTER GELENKSTELLUNG (0 = THETA=0, 1 = THETA=THETA ALT)
$SINGUL_POS[3]=0 ;BEHANDLUNG EINER UNDEFINIERTER GELENKSTELLUNG (0 = THETA=0, 1 = THETA=THETA ALT)
REAL $DIS_WRP1=1440.0 ;MITTLERER ABSTAND HANDPUNKT ZUR SINGULARITAET 1
REAL $DIS_WRP2=0.0 ;MITTLERER ABSTAND HANDPUNKT ZUR SINGULARITAET 2
INT $ORI_CHECK=0 ;ORIENTIERUNGSPRUEFUNG AN CP-ENDPUNKTEN (NUR BEIM 5 ACHSER)
FRAME $TIRORO={X 0.0,Y 0.0,Z 675.0,A 0.0,B 0.0,C 0.0} ;FRAME ZWISCHEN INTERNEN ROBOTERKOORDINATENSYSTEM UND ROBOTERKOORDINATENSYSTEM
FRAME $TFLWP={X 0.0,Y 0.0,Z 240.0,A 0.0,B 0.0,C 0.0} ;FRAME ZWISCHEN FLANSCH- UND HANDPUNKTKOORDINATENSYSTEM
FRAME $TX3P3={X 1200.0,Y 0.0,Z -41.0,A 0.0,B 90.0,C 0.0} ;ANBRINGUNG DER ROBOTERHAND
ENDDAT
```

IV. CONCLUSION

Inverse kinematics system of any 6R Robot manipulator can generally be defined as finding out the lower to upper joint angles for specified Cartesian position as well as orientation of an end effector motion and opposite of this, determining position and orientation of an end effector position for given joint variables is known as forward kinematics motion. Inverse kinematic having unique solution but in case of Forward kinematics it does not provide any closed loop system to resolve the problem as soon as possible for any configuration of Industrial Robot manipulator.

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