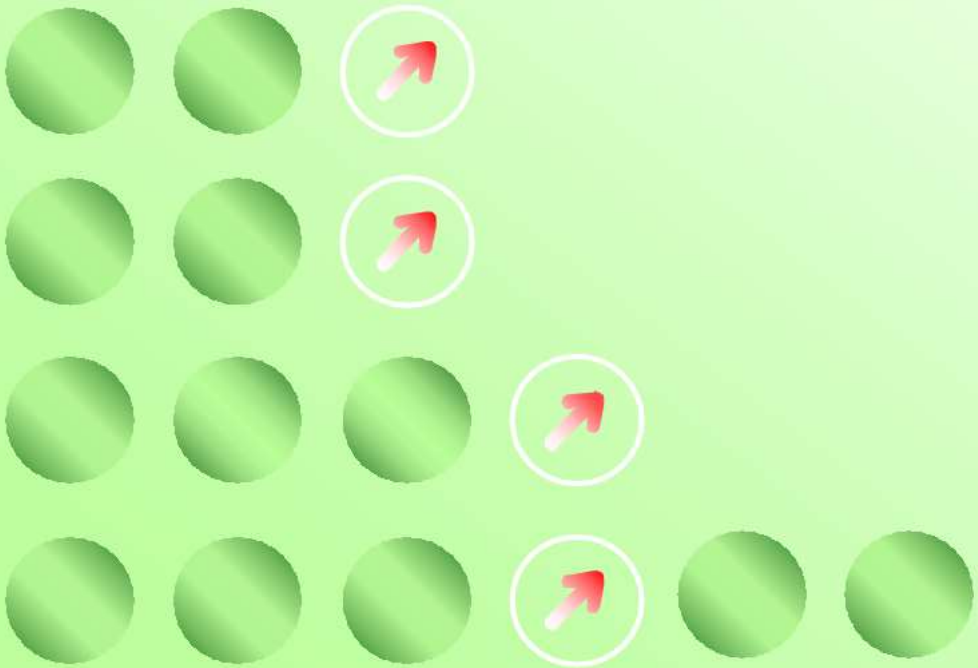
Robot and Servo Drive Lab.

Interfacing the Microbot TeachMover with a Personal Computer

05/07/2014

TARYUDI



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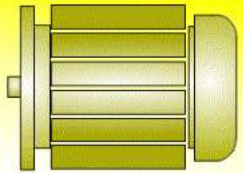
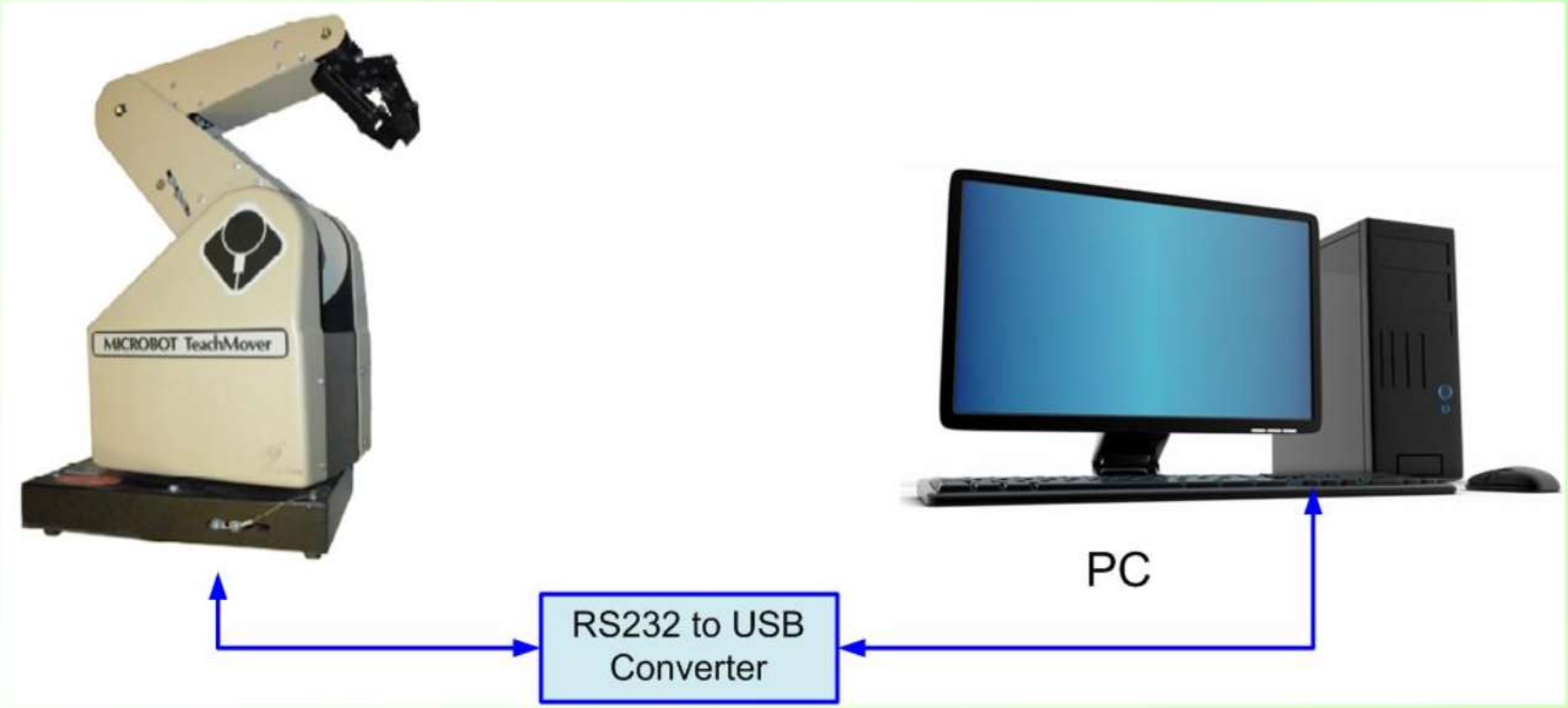


- **System Architecture**
- Microbot Specification
- Serial Communication interface
- Software Design
- Study Results
- Conclusion

System architecture



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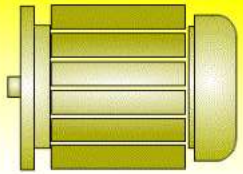

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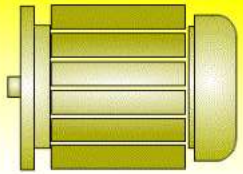
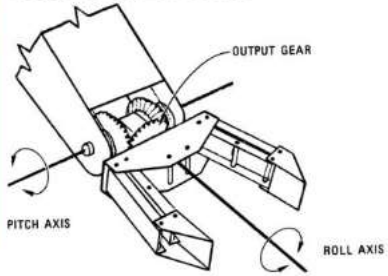
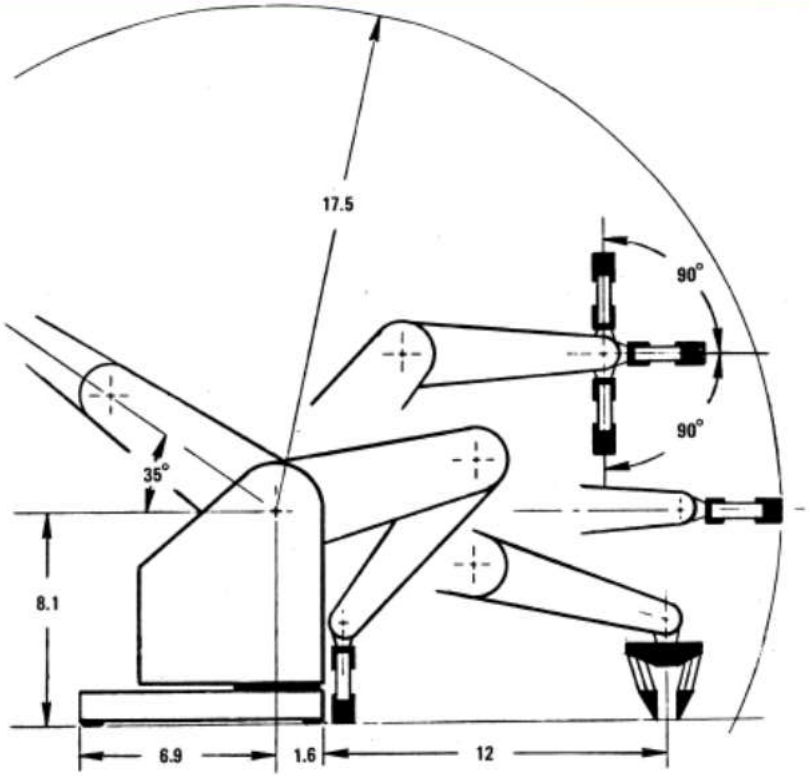
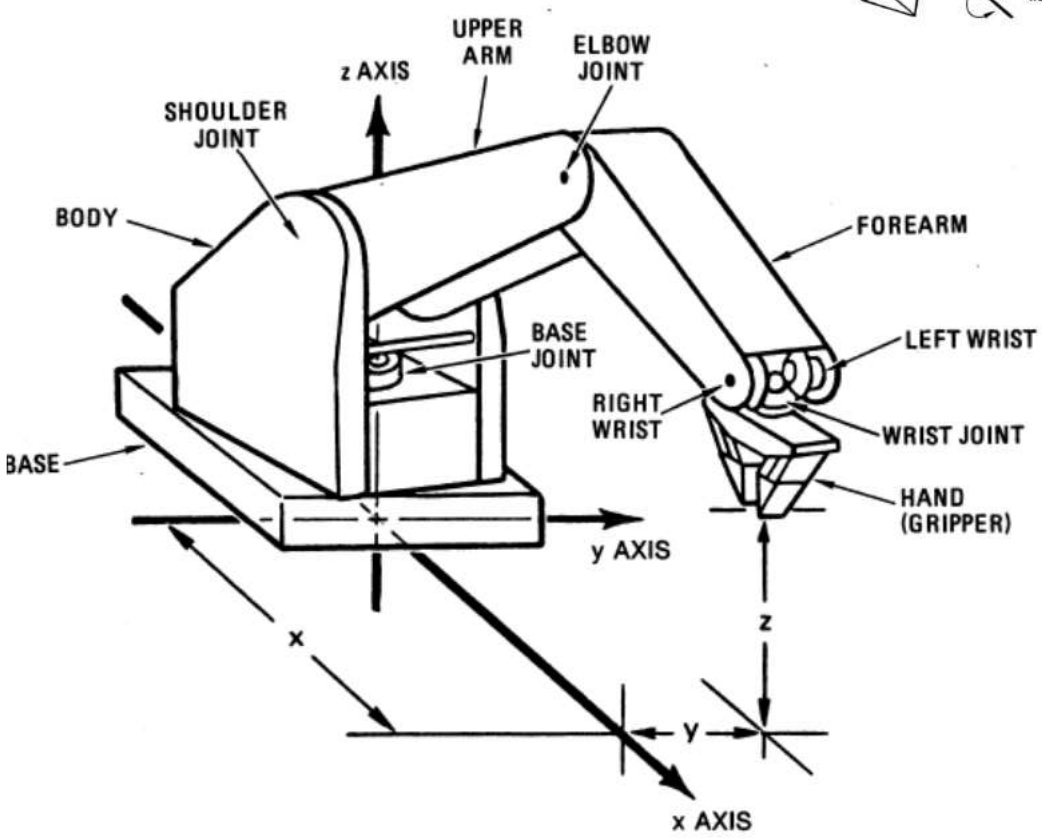
Microbot Mechanical Construction

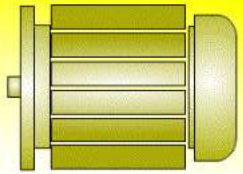








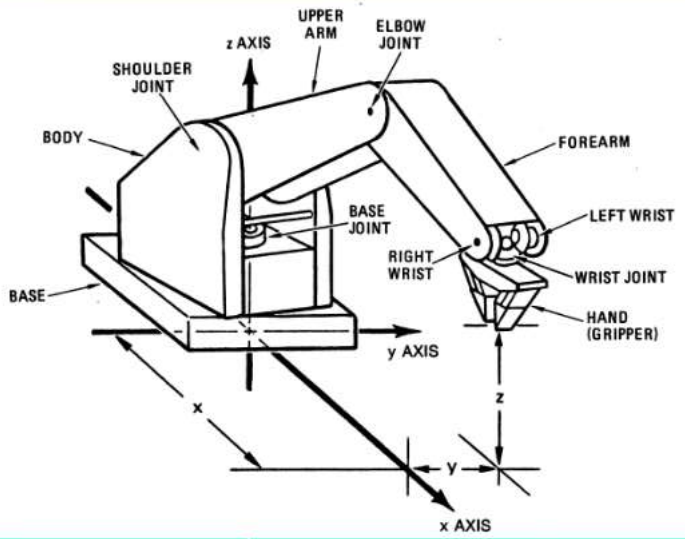
General Specification of Microbot



- Configuration : 5 revolution axes and integral hand
- Drive : Electric stepper motor
- Controller : 6502A Microprocesor with 4K bytes of EPROM and 1 K bytes of RAM located in base of unit.
- Interface : Dual RS-232C asynchronous serial communications interfaces (baudrate is switch-selectable between 110, 150, 300, 600, 1200, 2400, 4800, and 9600 bps)
- Teach control : 14 key 13 function keyboard; 5 output and 7 input bits under computer control

Microbot Specification

MOTOR STEPS AND JOINT ROTATIONS			
MOTOR	JOINT	STEPS PER DEGREE	STEPS PER RADIAN
1	Base	19.64	1125
2	Shoulder	19.64	1125
3	Elbow	11.55	672
4	Right wrist	4.27	241
5	Left wrist	4.27	241



Motion	Max range of motion	Speed(full load)	Speed (No load)
Base	± 90 º	0.37 rad/sec	0.42 rad/sec
Shoulder	+144 º , -35 º	0.15 rad/sec	0.36 rad/sec
Elbow	+0 º , -149 º	0.23 rad/sec	0.82 rad/sec
Wrist Roll	± 360 º	1.31 rad/sec	2.02 rad/sec
Wrist Pitch	± 90 º	1.31 rad/sec	2.02 rad/sec
Hand	0-3 in	8 lb/sec* (35n/sec)	(20mm/sec)

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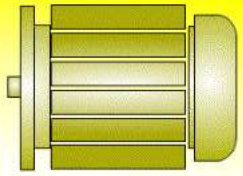

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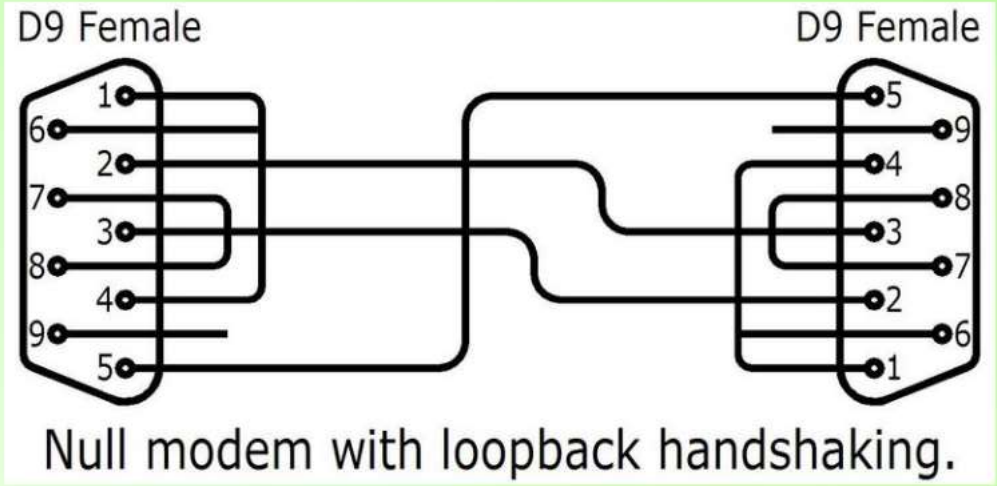
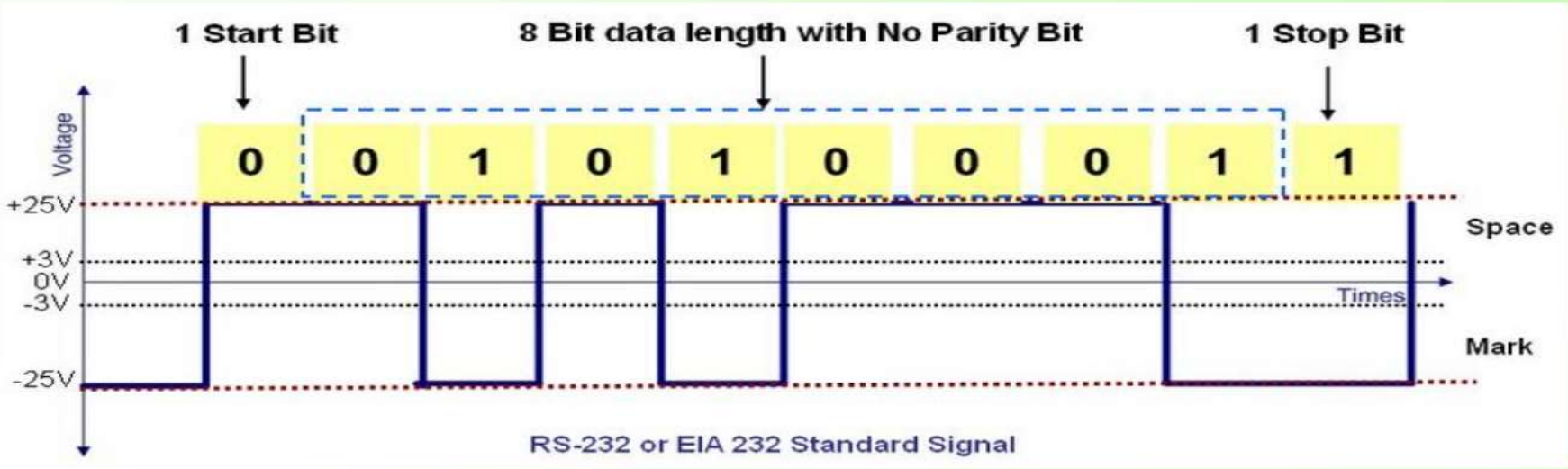
Serial Communication

- Electrical Connections
- Baud rate = 9600 bps
- Parity = None
- Data bits = 8 bit
- Stop bit = 1



Null modem with loopback handshaking.



RS-232 or EIA 232 Standard Signal

ASCII CODE

- **EXAMPLE**

@ = 40 (Hexadecimal)
= 64 (Decimal)

SPACE= 20 H
= 32 D

CR= 0D HEXA
= 13 D

	0	1	2	3	4	5	6	7
0	NUL	DLE	space	0	@	P	`	p
1	SOH	DC1 XON	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3 XOFF	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
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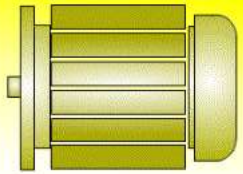

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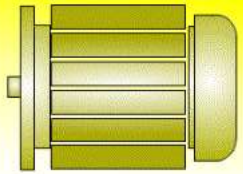
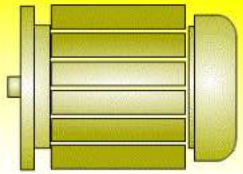
Software Design



- Algorithm
  - Initialization port
  - Open serial port
  - Read command
  - Setup command format
  - Send command
  - Read feedback

Command Format

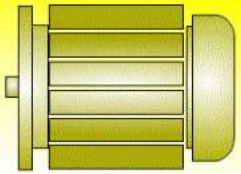


- **@STEP**
- The @STEP command causes all six of stepper motors to move simultaneously. The syntax of this command is:

- @STEP <SP>,<J1>,<J2>,<J3>,<J4>,<J5>,<J6>,<OUT>,<CR>

- Where:
  - <SP> gives the speed of motion (the value : 0 – 245)
  - <J1> to <J6> are the number of half- steps that each of the six motors is to be moved
  - <OUT> specifies the bit pattern to go to the user outputs
  - <CR> signifies carriage return

Command Format



- **@READ**

  This command is used to read the actual values of the internal position register. The syntax is:

  @READ<CR>

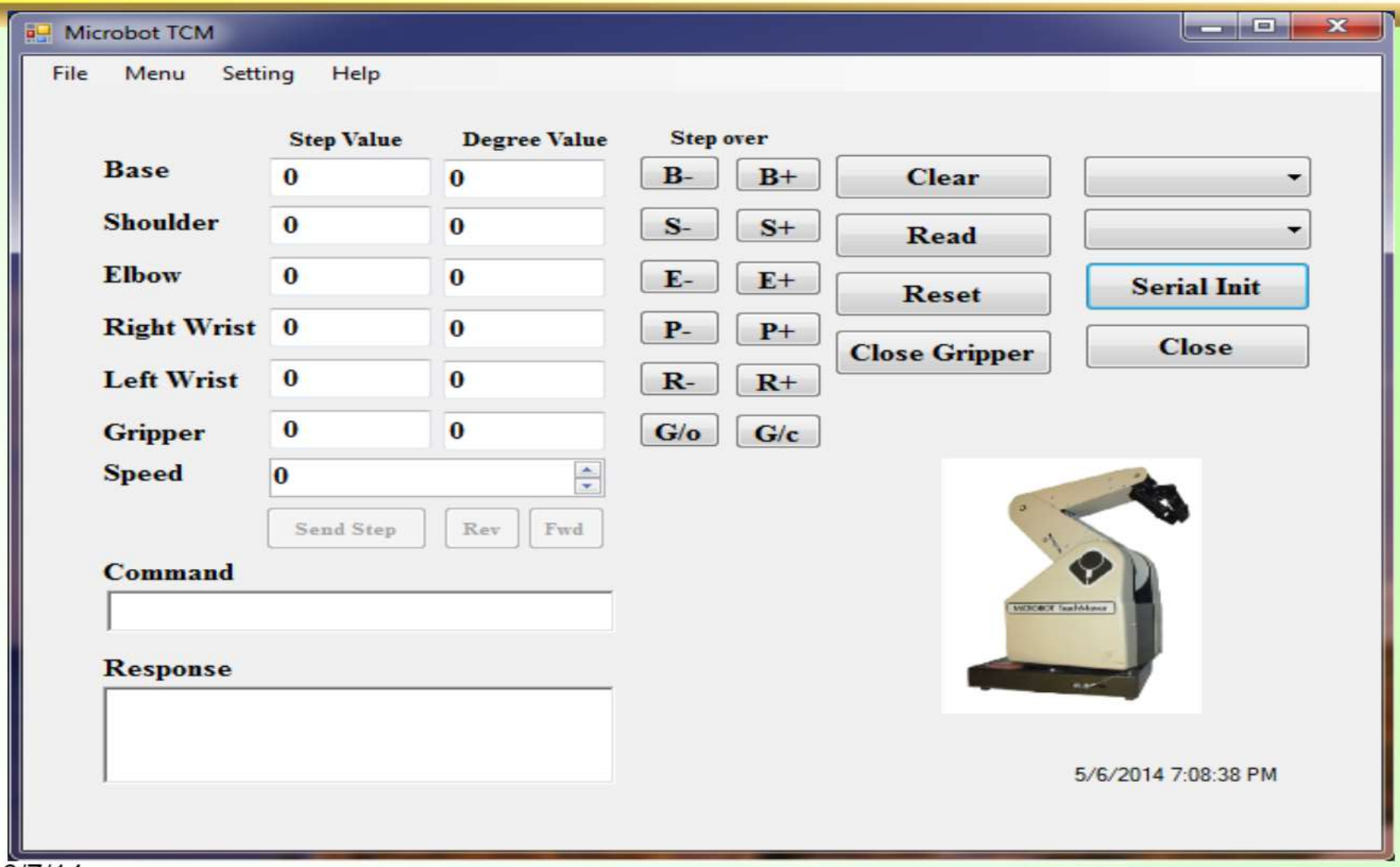
  The arm responds with [0<CR>] or [1<CR>] followed by a string of numbers:

  <K1>, <K2>,<K3>,<K4>,<K5>,<K6>,<I><CR>

  Where:

- <K1> to <K6> are the actual value of each register for stepper motor 1 to 6, <I> is the output value

Graphic User Interface Design



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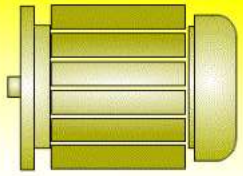

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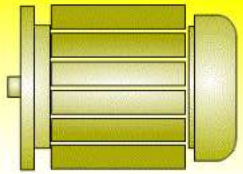
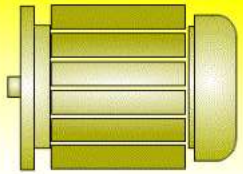
Results



- Video
- Hardware and Software

Reference



- Manual book Microbot TeachMover 1984

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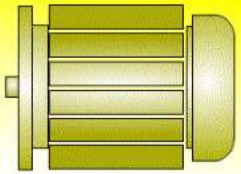

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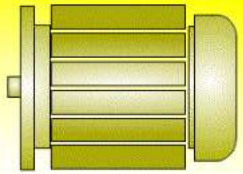
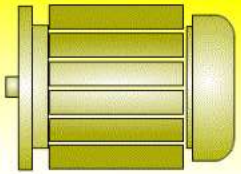
Conclusion



- Interfacing Microbot teachmover with a PC using serial communication interface has been succeed.



Thank you very much for your attention ..

Any Question

or

Suggestion ?