7
Referências Bibliográficas

Allota, B., e Colombo, C. (1999). On the use of linear camera-object interaction models in visualservoing. *IEEE Transaction on Robotics and Automation* , pp. 350-357.

Asada, H., e Slotine, J.-J. E. (1986). *Robot Analysis and Control.* Wiley-Interscience.

Astrom, K. J., e Hagglund, T. (1995). *PID Controllers: Theory, Design and Tuning.* ISA.

Augustson, T. M. (2007). *Vision based real time calibration of robots with application in subsea intervations.* Dissertação de Mestrado, Pontifícia Universidade Católica do Rio de janeiro.

Forsyth, D. A., e Ponce, J. (2003). *Computer Vision - A Modern Approach*. Prentice-Hall.

Harris, C., e Stephens, M. (1988). A combined corner and edge detector. *In Fourth Alvey Vision Conference* (pp. 147-151). Manchester, UK: The Plessey Company.

Hartley, R., e Zisserman, A. (2000). *Multiple View Geometry in Computer Vision.* Cambridge University Press.

Houshangi, N. (1990). Control of a robotic manipulator to grasp a moving target using vision. *IEEE international Conference on Robottics and Automation*, vol.1, pp. 604-609.

Hutchinson, S., Hager, G., e Corke, P. (October de 1996). A tutorial on visual servo control. *IEEE Transactions on Robotics and Automation* , pp. 651-670.

Inoue, H., e Shirai, Y. (1971). *Guiding a robot by visual feedback assembling tasks.* Eletrotechnical Laboratory Chiyoda-ku, Toquio, Japão.

Lowe, D. G. (2004). Distinctive image features from scale-invariant keypoints. *international Journal of Computer Vision* , pp. 91-110.

Ogata, K. (1997). *Modern Control Engineering.* Prentice-Hall.

Sanderson, A., e Weiss, L. (1980). Image-based visual servo control using relational graph error signals. *Proc. IEEE* , pp. 1074-1077.

Smith, E., e Papanikolopoulos, N. (1996). Vision-Guided Robotic Grasping: Issues and Experiments. *IEEE Intetrnational Conference on Robotics and Automation* , pp. 3203-3208, vol.4.

Tomasi, C., e Kanade, T. (1991). Detection and Tracking of Point Features. *Technical Report CMU-CS-91-132*

Trucco, E., e Verri, A. (1998). *Introductory Techniques for 3-D Computer Vision.* Prentice Hall.

Ziegler, J. G., e Nichols, N. B. (1942). Optimum settings for automatic controllers. *ASME Transactions* , pp. 759-768.

Apêndice I

Especificações dos motores *Banebots* utilizados na automatização da mesa coordenada XYθ, apresentado na Figura 20.

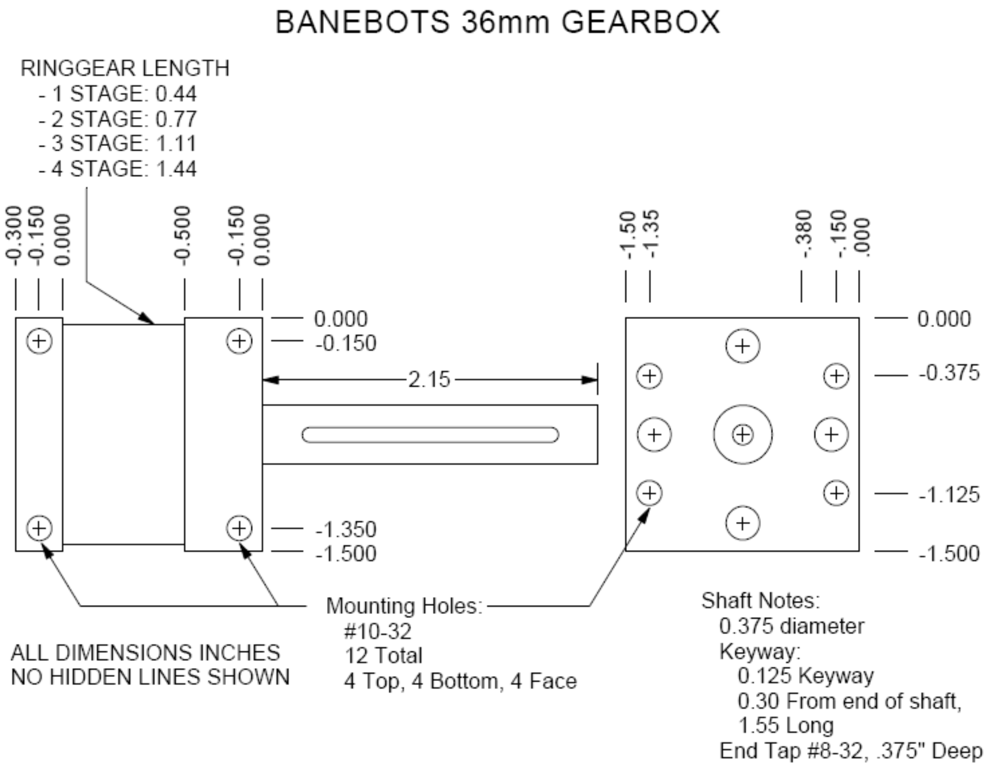
Physical

Type	: Planetary	
Reduction	: 16:1	
Stages	: 2	
Gear Material	: All Metal	
Weight (Gearbox only)	: 6.2 oz	(174g)
Weight (with motor)	: 11.6 oz	(327g)
Length (Gearbox only)	: 1.6 in	(40mm)
Length (with motor)	: 3.7 in	(93mm)
Width (Sqaure)	: 1.5 in	(38mm)
Shaft Diameter	: 0.375 in	(10mm)
Shaft Length	: 2.15 in	(55mm)
Shaft Key	: 0.125 in	(3.2mm)
Shaft End Tap	: #8-32	
Mounting Holes (12)	: #10-32	

Calculated Performance*

Motor	: RS-540 (Pinion)	
Operating v	: 4.5v – 12v	
Nominal v	: 12v	
No Load RPM	: 1050	
No Load A	: 1ª	
Stall Current	: 42ª	
Stall Torque	: 632 oz-in	4461 mN-m
Kt	: 15 oz-in/A	106 mN-m/A
kV	: 88 rpm/v	
RPM - Peak Eff	: 908	
Torque - Peak Eff	: 99.3 oz-in	701 mN-m
Current - Peak Eff	: 6.6ª	

Esquema do Motor:



Apêndice II

Datasheet do microcontrolador PIC 16F767, utilizado no sistema eletrônico da mesa coordenada,e apresentado na Figura 25.

Low-Power Features:

- Power-Managed modes:
  - Primary Run (XT, RC oscillator, 76 µA, 1 MHz, 2V)
  - RC_RUN (7 µA, 31.25 kHz, 2V)
  - SEC_RUN (9 µA, 32 kHz, 2V)
  - Sleep (0.1 µA, 2V)
- Timer1 Oscillator (1.8 µA, 32 kHz, 2V)
- Watchdog Timer (0.7 µA, 2V)
- Two-Speed Oscillator Start-up

Oscillators:

- Three Crystal modes:
  - LP, XT, HS (up to 20 MHz)
- Two External RC modes
- One External Clock mode:
  - ECIO (up to 20 MHz)
- Internal Oscillator Block:
  - 8 user-selectable frequencies (31 kHz, 125 kHz, 250 kHz, 500 kHz, 1 MHz, 2 MHz, 4 MHz, 8 MHz)

Analog Features:

- 10-bit, up to 14-channel Analog-to-Digital Converter:
  - Programmable Acquisition Time
  - Conversion available during Sleep mode
- Dual Analog Comparators
- Programmable Low-Current Brown-out Reset (BOR) Circuitry and Programmable Low-Voltage Detect (LVD)

Peripheral Features:

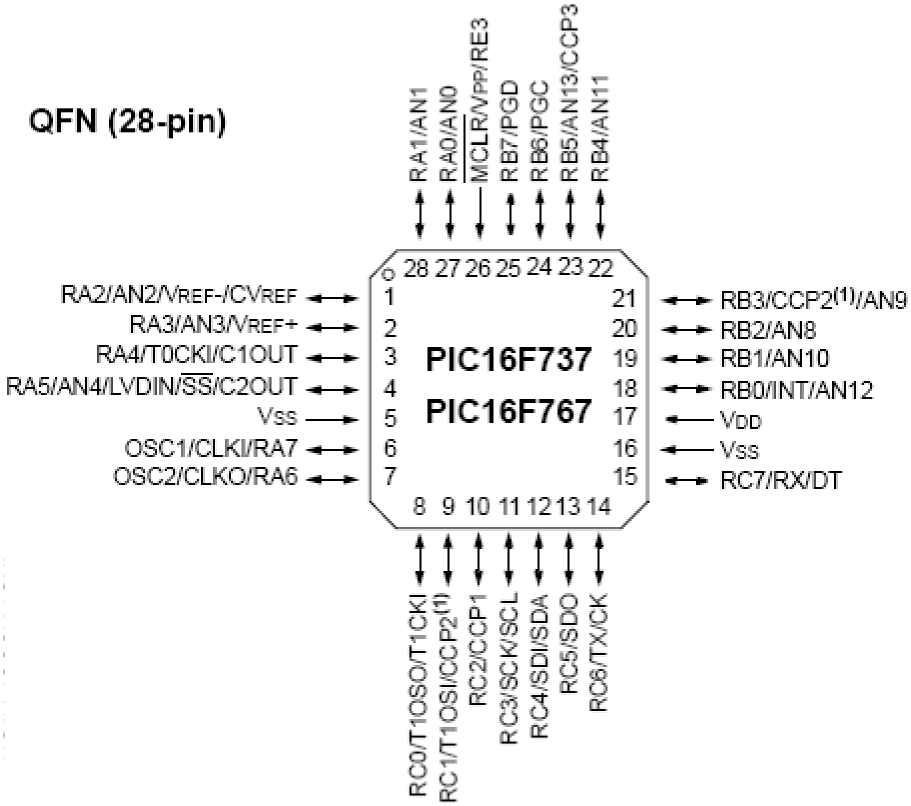
- High Sink/Source Current: 25 mA
- Two 8-bit Timers with Prescaler
- Timer1/RTC module:
  - 16-bit timer/counter with prescaler
  - Can be incremented during Sleep via external 32 kHz watch crystal
- Master Synchronous Serial Port (MSSP) with 3-wire SPI™ and I^2C™ (Master and Slave) modes
- Addressable Universal Synchronous Asynchronous Receiver Transmitter (AUSART)
- Three Capture, Compare, PWM modules:
  - Capture is 16-bit, max. resolution is 12.5 ns
  - Compare is 16-bit, max. resolution is 200 ns
  - PWM max. resolution is 10 bits
- Parallel Slave Port (PSP) – 40/44-pin devices only

Special Microcontroller Features:

- Fail-Safe Clock Monitor for protecting critical applications against crystal failure
- Two-Speed Start-up mode for immediate code execution
- Power-on Reset (POR), Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
- Programmable Code Protection
- Processor Read Access to Program Memory
- Power-Saving Sleep mode
- In-Circuit Serial Programming™ (ICSP™) via two pins
- MPLAB® In-Circuit Debug (ICD) via two pins
- $\overline{MCLR}$ pin function replaceable with input only pin

Device	Program Memory (# Single-Word Instructions)	Data SRAM (Bytes)	I/O	Interrupts	10-bit A/D (ch)	Comparators	CCP (PWM)	MSSP		AUSART	Timers 8/16-bit
								SPI™	I^2C™ (Master)		
PIC16F737	4096	368	25	16	11	2	3	Yes	Yes	Yes	2/1
PIC16F747	4096	368	36	17	14	2	3	Yes	Yes	Yes	2/1
PIC16F767	8192	368	25	16	11	2	3	Yes	Yes	Yes	2/1
PIC16F777	8192	368	36	17	14	2	3	Yes	Yes	Yes	2/1

QFN (28-pin)


RA1/AN1
RA0/AN0
MCLR/VPP/RE3
RB7/PGD
RB6/PGC
RB5/AN13/CCP3
RB4/AN11
28 27 26 25 24 23 22
RA2/AN2/VREF-/CVREF
RA3/AN3/VREF+
RA4/T0CKI/C1OUT
RA5/AN4/LVDIN/SS/C2OUT
VSS
OSC1/CLKI/RA7
OSC2/CLKO/RA6
1
2
3
4
5
6
7
PIC16F737
PIC16F767
21
20
19
18
17
16
15
RB3/CCP2(1)/AN9
RB2/AN8
RB1/AN10
RB0/INT/AN12
VDD
VSS
RC7/RX/DT
8 9 10 11 12 13 14
RC0/T1OSO/T1CKI
RC1/T1OSI/CCP2(1)
RC2/CCP1
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX/CK

Apêndice III

Esquema da placa eletrônica utilizada no trabalho (Figura 25).