

Hands-Free: a robot augmented reality teleoperation system

Cristina Nuzzi*, Stefano Ghidini, Roberto Pagani, Simone Pasinetti and Giovanna Sansoni

Abstract—This electronic document is a live template. The various components of your paper [title, text, heads, etc.] are already defined on the style sheet, as illustrated by the portions given in this document.

I. INTRODUCTION

Nella intro mettere reference al related work. Dalla intro spiegare il focus del paper e le novel contribution.

II. DEVELOPED SYSTEM

A. Hand-Gesture Recognition

Che rete uso, come ho impostato i gesti, lo scheletro con openpose citato, funzione per ricavare il gesto basata sull'assenza del finger, invariante dall'orientamento e dallo zoom. Immagini di esempio.

B. Workspace Calibration and Mapping

Qui spiego il problema del dover riferire i keypoints della mano ricavati nel primo workspace verde al workspace del robot per poterlo correttamente movimentare. I passi per questa procedura sono due: prima calibro il primo workspace verde rispetto a come la kinect lo inquadra, e questo sar il workspace di riferimento. Ottengo una trasformazione pixel to reale per sapere in metri dove posizionata la mano (i keypoints) nel workspace verde. Poi devo riferire questo workspace verde a quello in cui si muove il robot. Per farlo devo sapere il rapporto di mapping tra il w1 e il w2, cio a cosa corrisponde il punto 1 di w1 in w2 ecc. Poi devo fare la stessa cosa per capire qual il riferimento del robot rispetto a w2. Per farlo devo muovere sperimentalmente il robot in diverse posizioni del master e ricavare a cosa corrispondono nel master rispetto al robot per ottenere questo mapping. Immagini che rappresentano questa procedura. Procedura di calibrazione automatica?

III. EXPERIMENTS

Due esperimenti: uno sulla ripetibilit del posizionamento del robot rispetto alla teleoperazione e uno sul posizionamento corretto del robot su un oggetto stampato in 3D per l'esperimento. Specifiche del set-up utilizzato: rappresentazioni dei master di calibrazione usati, specifiche delle loro dimensioni, robot usato, pinza customizzata con laserino, oggetto 3D stampato.

This work was not supported by any organization.

Cristina Nuzzi, Roberto Pagani, Simone Pasinetti and Giovanna Sansoni are members of the Department of Mechanical and Industrial Engineering at University of Brescia, Via Branze 38, 25123 Brescia, Italy.

* Corresponding author, e-mail: c.nuzzi@unibs.it

Stefano Ghidini is a member of the STIMA-CNR, Via Alfonso Corti 12, 20133 Milan, Italy. He is also a member of the Department of Mechanical and Industrial Engineering at University of Brescia, Via Branze 38, 25123 Brescia, Italy.

A. First experiment

Spiegazione della procedura. Descrizione della pinza laser usata per il posizionamento accurato. Come prendo i dati? Lascio gi un segno sul master (a mano?), prendo una foto? Risultati ottenuti. Commento.

B. Second experiment

Descrizione della piastra 3D stampata per l'esperimento e obiettivi. Risultati ottenuti. Commento.

IV. USING THE TEMPLATE

A. Figures and Tables

Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation Fig. 1, even at the beginning of a sentence.

TABLE I
AN EXAMPLE OF A TABLE

One	Two
Three	Four

We suggest that you use a text box to insert a graphic (which is ideally a 300 dpi TIFF or EPS file, with all fonts embedded) because, in an document, this method is somewhat more stable than directly inserting a picture.

Fig. 1. Inductance of oscillation winding on amorphous magnetic core versus DC bias magnetic field

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity Magnetization, or Magnetization, M, not just M. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write Magnetization (A/m) or Magnetization A[m(1)], not just A/m. Do not label axes with a ratio of quantities and units. For example, write Temperature (K), not Temperature/K.

V. CONCLUSIONS

Conclusioni sul progetto/esperimenti ottenuti. Problematice incontrate e come sono state risolte. Future developments.

REFERENCES

- [1] G. O. Young, Synthetic structure of industrial plastics (Book style with paper title and editor), in *Plastics*, 2nd ed. vol. 3, J. Peters, Ed. New York: McGraw-Hill, 1964, pp. 1564.
- [2] W.-K. Chen, *Linear Networks and Systems* (Book style). Belmont, CA: Wadsworth, 1993, pp. 123135.
- [3] H. Poor, *An Introduction to Signal Detection and Estimation*. New York: Springer-Verlag, 1985, ch. 4.
- [4] B. Smith, An approach to graphs of linear forms (Unpublished work style), unpublished.
- [5] E. H. Miller, A note on reflector arrays (Periodical styleAccepted for publication), *IEEE Trans. Antennas Propagat.*, to be published.
- [6] J. Wang, Fundamentals of erbium-doped fiber amplifiers arrays (Periodical styleSubmitted for publication), *IEEE J. Quantum Electron.*, submitted for publication.
- [7] C. J. Kaufman, Rocky Mountain Research Lab., Boulder, CO, private communication, May 1995.
- [8] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, Electron spectroscopy studies on magneto-optical media and plastic substrate interfaces(Translation Journals style), *IEEE Transl. J. Magn.Jpn.*, vol. 2, Aug. 1987, pp. 740741 [Dig. 9th Annu. Conf. Magnetism Japan, 1982, p. 301].
- [9] M. Young, *The Technical Writers Handbook*. Mill Valley, CA: University Science, 1989.
- [10] J. U. Duncombe, Infrared navigationPart I: An assessment of feasibility (Periodical style), *IEEE Trans. Electron Devices*, vol. ED-11, pp. 3439, Jan. 1959.
- [11] S. Chen, B. Mulgrew, and P. M. Grant, A clustering technique for digital communications channel equalization using radial basis function networks, *IEEE Trans. Neural Networks*, vol. 4, pp. 570578, July 1993.
- [12] R. W. Lucky, Automatic equalization for digital communication, *Bell Syst. Tech. J.*, vol. 44, no. 4, pp. 547588, Apr. 1965.
- [13] S. P. Bingulac, On the compatibility of adaptive controllers (Published Conference Proceedings style), in *Proc. 4th Annu. Allerton Conf. Circuits and Systems Theory*, New York, 1994, pp. 816.
- [14] G. R. Faulhaber, Design of service systems with priority reservation, in *Conf. Rec. 1995 IEEE Int. Conf. Communications*, pp. 38.
- [15] W. D. Doyle, Magnetization reversal in films with biaxial anisotropy, in *1987 Proc. INTERMAG Conf.*, pp. 2.2-12.2-6.
- [16] G. W. Juetten and L. E. Zeffanella, Radio noise currents n short sections on bundle conductors (Presented Conference Paper style), presented at the IEEE Summer power Meeting, Dallas, TX, June 2227, 1990, Paper 90 SM 690-0 PWRS.
- [17] J. G. Kreifeldt, An analysis of surface-detected EMG as an amplitude-modulated noise, presented at the 1989 Int. Conf. Medicine and Biological Engineering, Chicago, IL.
- [18] J. Williams, Narrow-band analyzer (Thesis or Dissertation style), Ph.D. dissertation, Dept. Elect. Eng., Harvard Univ., Cambridge, MA, 1993.
- [19] N. Kawasaki, Parametric study of thermal and chemical nonequilibrium nozzle flow, M.S. thesis, Dept. Electron. Eng., Osaka Univ., Osaka, Japan, 1993.
- [20] J. P. Wilkinson, Nonlinear resonant circuit devices (Patent style), U.S. Patent 3 624 12, July 16, 1990.