DSP based real-time adaptive vital signals extraction algorithm using CW-Radar for wheelchair users

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Abstract:

A TI C67XX DSP based platform was developed for real time processing of the biomedical signals obtained from sensors integrated in a wheelchair. Special attention was granted to the use of Frequency Modulated Continuous Wave Doppler Radars (FMCW-DRadar) for cardio-respiratory activity assessment. A practical approach concerning artifacts removal through adaptive digital filtering implemented in the DSP platform was one of the aims of the work. Additionally, in order to increase the accuracy of the results, programmable data acquisition architecture was designed and implemented and a data communication protocol between the DSP platform and a host computer associated with graphical user interface was carried out. Several elements related to digital filtering design and implementation and experimental results concerning the cardio-respiratory monitoring are included in the present article.

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Contents

I. Introduction

Population aging problem is increasing the need of in home health care for elderly people particularly for people with limited mobility. Pervasive monitoring of cardio-respiratory status during normal life activity is a challenging problem. Recently, multiple unobtrusive vital signs monitoring systems have been developed [1], [2], [3], [4], and [5], most of them being characterized by processing of the data in a PC that it is wired or wireless connected to the measurement module based on radar. In this work is reported the design and implementation of a DSP based system which has the ability to implement real time multiple filtering and adaptive algorithms associated with Doppler radar sensor output signal that was used for motor activity and vital signals monitoring. Fig. 1 depicts the DSP based system architecture. The FMCW-radars were appropriately mounted on the back part of the wheelchair backrest to monitor the wheelchair user vital signs, while the second radar detects the wheel motion through the detection of metallic plates mounted on one of the wheelchair wheel plastic spokes. Previous works on radar based vital signal monitoring were characterized by processing of the data by a remote PC that receive the data wirelessly from a data acquisition and wireless communication module mounted on the wheelchair.

Authors

Figures

References

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