

Project proposal

HW/SW Co-design

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Problem

When an elderly person fall it can be quite serious, and having a way to communicate with the outside world is therefore not only a benefit for getting help quickly, but also of great comfort for the elderly.

Today's systems for solving this are to use a stationary speaker and microphone and a wireless button which the elderly may press to signal that he or she needs assistance.

The disadvantage here is obvious. What if the elderly is in another room? Some systems do not include the speaker and microphone at all, but only a button, but very often the elderly may use it simply to get in touch with someone, which is of great annoyance to the help-care professionals.

Solution

By integrating the microphone and speaker with the emergency button the microphone and speaker is always in the right room and the elderly is able to explain the problem and the "emergency" may be handled "on the phone".

Issues

The device must be very light and have sufficient battery capacity for at least 24 hours stand-by and at least 5 minutes of speech.

It must be very easy to operate and recharge.

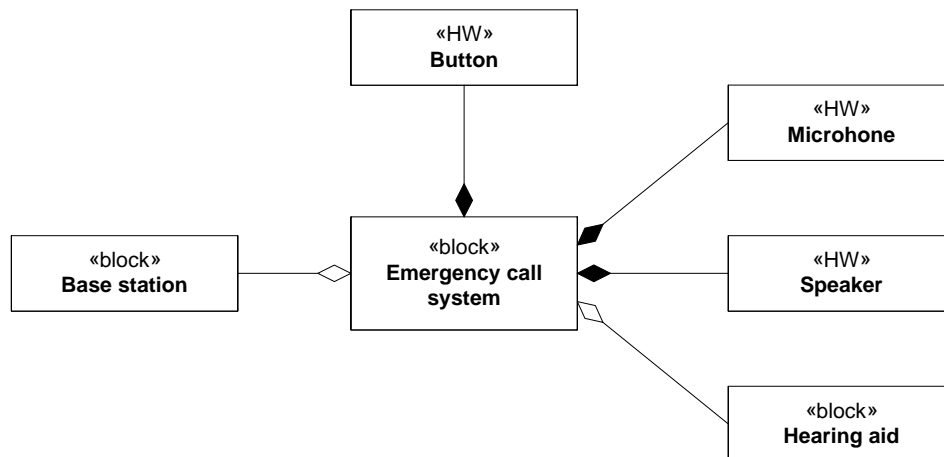
Solution

With today's technology it is possible to package such functionality into a very small package. Furthermore by placing a dedicated ISM transceiver (868MHz) on permanent power in the house or apartment this may be used for low-power communication (far lower than GSM).

Assignment

Propose a solution for the portable device on as small and light a footprint as possible and with as low power consumption as possible, including its implementation in HW and/or SW.

Design



1. The audio quality is allowed to be poor.
2. The volume on the speakers must take into account some degree of reduced hearing on behalf of the elderly.
3. Some degree of delay in the audio stream is allowed to conserve power (buffering and burst transmission).
4. The Base station is already designed and implemented using the ISM (Industrial, Scientific, Medical) frequency band, specifically the sub-frequency band reserved for Social Alarms (869.2-869.25 MHz) and/or Wireless Audio (863-865 MHz) by the EU. The communication protocol may be defined as needed.
5. Some verification that the unit is working (heartbeat) must be implemented.
6. The hearing aid communication frequency and protocol is a predefined standard.
7. Charging the device might be done with an inductive charging plate and special battery pack. An existing product that may simply be used.

Comments

Naturally this project relates to System Engineering and HW/SW Co-design, as it is a matter of engineering the system and deciding on what to implement in HW and SW.

The problem with the project is the low data-flow requirements. With a low-grade audio there is not much filter processing. There is however the matter of handling the hard real-time requirements for the wireless data-bus itself. Naturally one can purchase an RF Transceiver ASIC, but it would also be possible to develop this as an IP and simply have an oscillator controlled by the FPGA, then there are real-time requirements of 868 MHz, even though it is only used in short bursts. Whether this is the best solution from a power consumption point of view is naturally part of the assignment.