Evaluating technical viability of a loneliness detector system for older adults from rural areas

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Purpose During the last years, many researches have studied how solitude impact on health (Steptoe, A. et al., 2004), identifying loneliness among elders as a high priority problem. This issue is especially apparent in rural areas where a large proportion of the population are older adults who live alone. However, this reality is hard to be objectively measured. Resources as scales and questionnaires (Ventura-León, J. et al, 2020) are usually applied to detect unwanted loneliness. Nevertheless, these approaches are not always able to reflect the reality and the whole context of solitude (Nzabona, A. et al., 2016). Therefore, the loneliness problems require a qualitative perspective, finding on technology a substantial resource to measure it. In the present work, a distributed sustainable architecture for studying loneliness is introduced, defining the components and evaluating its technical viability. **Method** The proposed architecture aims to detect, store and process the physical encounters of older adults to define a social graph which identifies potential candidates of suffering loneliness. Considering the possible lack of Internet connection in rural areas, the solution applies Bluetooth to operate. For this, the proposed solution counts with three main entities: 1) bracelets for ageing people, 2) smartphones from neighbors and 3) fixed beacons to receive data. Thus, ageing people are equipped with smart bracelets which keep track of the physical encounters they have with other older adults. Besides, considering elders may encounter with people from other ages, neighbors are identified by their smartphone, being discoverable by the bracelets. Finally, all this data is transmitted to a beacon which receives the registered encounters data from bracelets and builds a social graph, defining elders as nodes and links as the relations they have with other people. As a result, it is possible to identify potential candidates of suffering unwanted loneliness. **Results and Discussion** The proposed architecture requires the autonomous collaboration of bracelets and smartphones to scan devices and to transfer data. Then, considering the energetical constraints of these devices, battery consumption becomes a critical aspect to the technical viability. To analyze this, a study of the power consumption has been made, identifying the most recurrent tasks (scanning, sending and receiving) and its associated power requirement. Thus, Figure 1 reflects the obtained results, showing three different scenarios (*c1*, *c2* and *c3*) where node density is increased from low to high. This way, the left-y axe represents the average battery life in hours (*B(h)*) and right-y axe reflects the average energy consumption (*Eg (μA)*). As a result, the estimations shows that the architecture is operable for low density spaces (*c1* and *c2*), however, bracelets present some limitations at battery life, especially when device density is high (*c3*). Nevertheless, considering a future increase in battery capacity, the solution may find operability for every scenario.

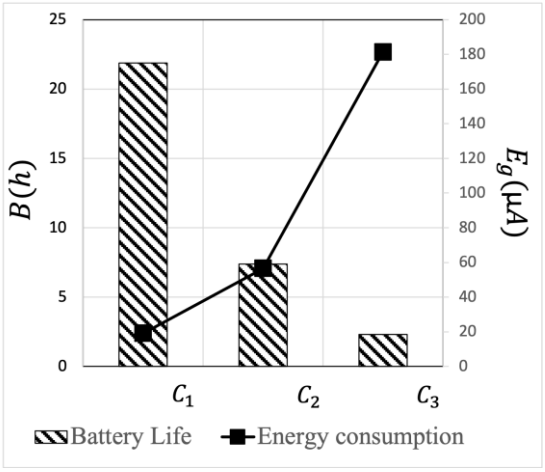

Figure 1. Battery life and energy consumption evolution.

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