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Low Power Personal Distress Beacon for Water Sports

Introduction: Water-related activities such as swimming, boating, kitesurfing, windsurfing and stand-up paddling represent widespread recreational pursuits all over the world. But as with every outdoor activity, there are risks involved, especially on larger bodies of water like lakes or the sea, where life-endangering incidents can occur. Although mobile phones are a given nowadays, the chance that they are left ashore in such a situation is high because of the wet environment and the risk of losing it. Even if a cell phone was available, the handling would be impractical in an emergency scenario.
A dedicated hobbyist might want to safeguard against ending up in a life-threatening situation without the means to call for help. There are currently several products on the market that provide the required connectivity. However, they usually cost a few hundred Swiss francs and only work with an expensive subscription, since they communicate with the help of a network of satellites. In addition, they need to be kept charged in order to stay operational.

Objective: Due to the looming omnipresence of IoT-enabled devices, highly specialized wireless telecommunication networks are emerging. Such networks go by the name LPWAN and are being extensively deployed at this very moment. They offer long range capabilities whilst enabling an extremely low power draw. These characteristics allow for the build of connected devices with low material costs and a substantial battery life of several years.
The goal of this thesis is to develop a low cost personal distress beacon that utilizes a LPWAN. The wearer of said product shall be able to pursue his passion on the water unhindered, while possessing the ability to call for help at the push of a button. As soon as this happens, an alarm will be sent to an appropriate emergency response institution. The transmitted alert data must also include the precise position of the wearer. Suitable hardware, software and a network needs to be evaluated and the final product shall be integrated into an existing alerting back-end.

Result: After a thorough market analysis, an appropriate low cost hardware was found and purchased. An agreement with the manufacturer was made, which allowed to on-board the device with different LPWAN providers, to configure and to read out the transmitted data without the use of their software tools, which are subject to a monthly fee. In close collaboration with the customer, the distress beacon was then integrated into the existing back-end. The components of the purchased hardware were scrutinized and its power draw analyzed to calculate an expected battery lifetime. Further, the possibility of sending GPS ephemeris data to the device via the LPWAN was examined.
Besides the aforementioned discussion points, research was conducted on how LoRa geolocation works, what it offers and what would be needed to implement it.