ACEIOT/KEEP Seminar

Date: 09th September 2022

Time: 10h30 AM -Kigali, Rwanda Time / 08h30 AM Accra, Ghana Time

Mode: Virtual

Self-Powered Smart Beehive Monitoring and Control System (SBMaCS)

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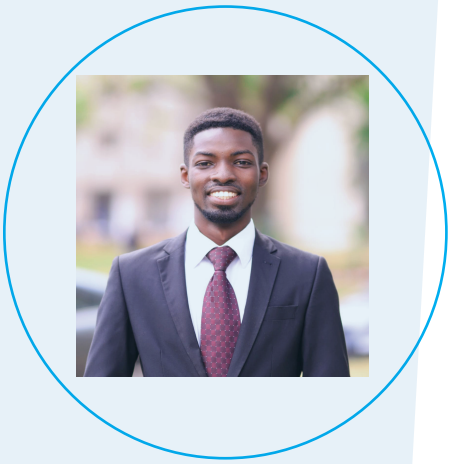
Beekeeping in Africa has been practiced for many years through successive generations and along inherited patterns. Beekeepers continue to face challenges in accessing consistent and business-driven markets for their bee products. In addition, the honeybee populations are decreasing due to colony collapse disorder (CCD), fire, loss of bees in swarming, honey buggers and other animals, moths, starvation, cold weather, and Varoa mites. The main issues are related to un-controlled temperature, humidity, and traditional management of beekeeping. These challenges result in low production of honey and colony losses. The control of the environmental conditions within and surrounding the beehives are not available to beekeepers due to the lack of monitoring systems. A Smart Beehive System using Internet of Things (IoT) technology would allow beekeepers to keep track of the amount of honey created in their hives and bee colonies even when they are far from their hives, through mobile phones, which would curtail the challenges currently faced by the beekeepers. However, there are challenges in the design of energy-efficient embedded electronic devices for IoT. A promising solution is to provide energy autonomy to the IoT nodes that will harvest residual energy from ambient sources, such as motion, vibrations, light, or heat. Researcher proposes a Self-Powered Smart Beehive Monitoring and Control System (SBMaCS) using IoT to support remote follow-up and control, enhancing bee colonies' security and thus increasing the honey productivity. First, we develop the SBMaCS hardware prototype interconnecting various sensors, such as temperature sensor, humidity sensor, piezoelectric transducer—which will work as a weight sensor—motion sensor, and flame sensor. Second, we introduce energy harvesting models to self-power the SBMaCS by analyzing the (i) energy harvested from adult bees' vibrations, (ii) energy harvesting through the piezoelectric transducer, and (iii) radio frequency energy harvesting. Third, we develop a mobile phone application that interacts with the SBMaCS hardware to monitor and control the various parameters related to the beehives. Finally, the SBMaCS PCB layout is also designed. SBMaCS will help beekeepers to successfully monitor and control some important smart beekeeping activities wherever they are using their mobile phone application

P2Blockchain: A Fully Decentralized Blockchain InteroperabilIty Architecture



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The rapid growth of blockchain has benefitted a lot of industries. Blockchain has provided a more secure way for processing and storing data. There has been a variety of proposed blockchain architectures and associated protocols to aid in developing blockchain-based solutions. However, the lack of blockchain-specific protocol or cryptographic standards has highlighted the issue of interoperability: the ability of heterogenous blockchains to communicate. This paper presents a heterogenous blockchain interoperability architecture based on the concept of blockchain gateways named P2Blockchain. The architecture targets data-based blockchain use cases like in IoT. A partially-managed decentralized interface is used for communication between heterogenous block-chains. Data is encrypted before being sent of the communication channel as a security measure with hash-based verification applied to ensure integrity of data transferred between blockchains. Light client verification, based on Simplified Payment Verification (SPV), is used as a final security measure to ensure only valid transactions go through consensus to be appended to the destination blockchain. A trust management service is used to monitor the behaviour of nodes participating in the interoperating process, which also provides input for electing a leader to perform some management tasks in the communication medium between the blockchains.