



RFID Tracking of a Queen Bee

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BACKGROUND

The decline of pollinator populations over the past several decades has been a leading problem in topics of ecosystem diversity, crop production, food security, and human welfare. The honey bee (Figure 1) is the pollinator that is predominantly managed to enhance agricultural production [1]. Studies have shown that there is clear evidence for severe regional declines in domestic honey bee stocks in the USA (59% loss of colonies between 1947 and 2005) and Europe [1].

Beekeeper Client Request

A beekeeper came to our junior design class with the need for a system that precisely monitors and communicates to him the location and activity of a queen bee inside the hive.



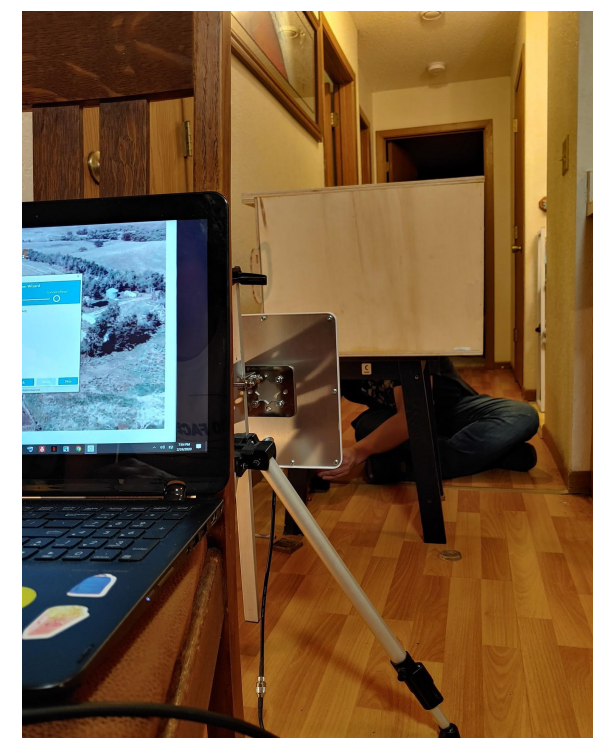
Credit: Wikipedia [2]

Significance of the Queen Bee's Activity

The queen bee's location and activity is important for a beekeeper to know because they can ensure she is alive, and they can avoid disturbing her by not removing the shelf she is on when checking on the hive. This contributes positively to the overall health of the hive and allows the beekeeper to know the hive's state. Ensuring beekeepers across the world are maintaining healthy hives will improve the global pollinator decline issue.

PROPOSED SOLUTION

The solution was a system that took a received signal strength indicator (RSSI) value and attributes it to a minimum movement threshold. From there an estimated distance of the Queen Bee can be attributed to a particular range of RSSI values.

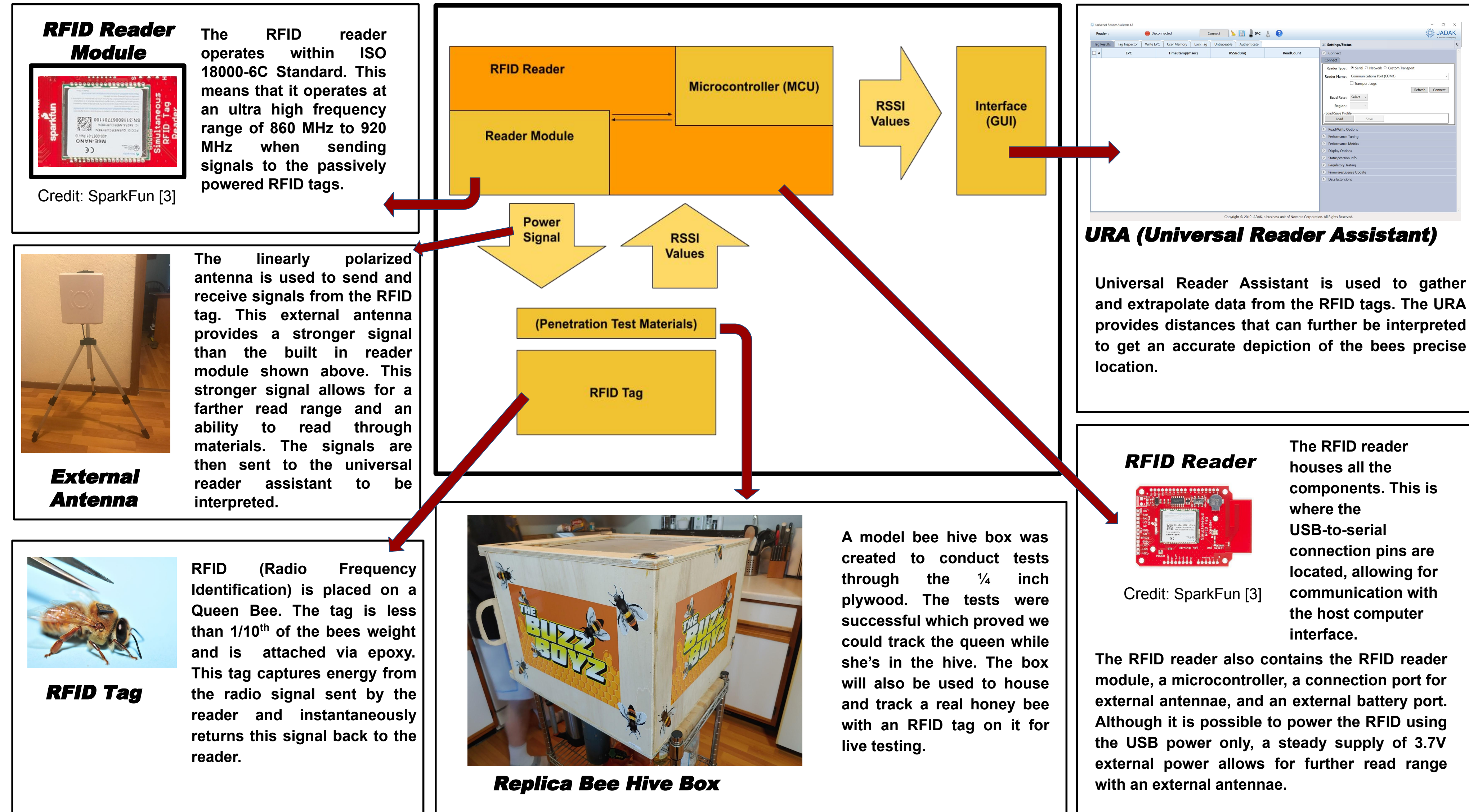


A photo of the whole solution setup during testing

For portability, a battery powered RFID reader was chosen. With a reader, paired with an external antennae and a Windows laptop, make for a system that can be easily picked up and moved to another hive. Testing proved positive, with a regular read range of up to 5 ft through the 1/4" wood model.

Continued testing will include penetration with internal noise, different build materials, and other environments.

SYSTEM DESIGN



FUTURE DIRECTION

- We would like to create a 3D printed housing for the RFID reader, battery, and other adapters in order to make the whole setup easily portable and therefore easier to use
- To add an automated data collection computer program that would instantly translate the received signal strength indicator values into a distance that would be more ideal for users to interpret
- Adding a secondary cooling mechanism would keep the reader module temperature low

REFERENCES

- [1] S.G. Potts et al. "Global pollinator declines: trends, impacts and drivers," *Trends in Ecology & Evolution*
- [2] www.wikipedia.com
- [3] www.sparkfun.com

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