APIMONDIA SCANDINAVIA 2025
SWEDEN | DENMARK | NORWAY

PP-254 [Beekeeping Technology and Quality]

A flexible, responsive and low-cost IT-based DIY apiary and honey flow surveillance system for your local beekeeper association

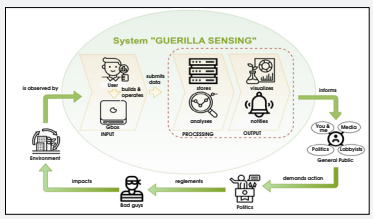
Thore Rump und Oliver Theel

A DIY Apiary and Honey Flow Surveillance System – Why?

- Provides answers to questions like:
  - Is there a honey flow to the hive?
  - How much honey flow occurs when?
  - Is the apiary location favorable?
  - Where does honey flow occur and where not?
  - Which apiary location is more favorable?
  - What is the course of the season?
  - Does a colony (still) have enough food supplies?
- Additional benefits:
  - Is there a swarming event?
  - Are there unusual activities potentially related to theft and vandalism?
- Legacy honey flow information system [1]:
  - TrachtNet, approx. 800 beehive scales, most of them in S & W Germany (see right figure)
  - uneasy access (costs & administration)

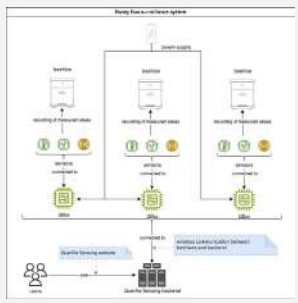
Architecture of the DIY Apiary and Honey Flow Surveillance System

1) Base system: Guerilla Sensing [2]

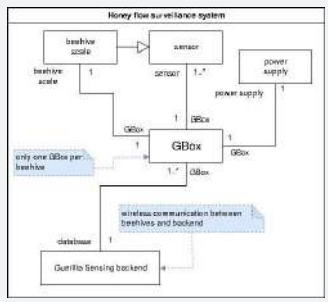


for live data visit
`bees-gs.informatik.uni-oldenburg.de`

2) Beehives with GBox

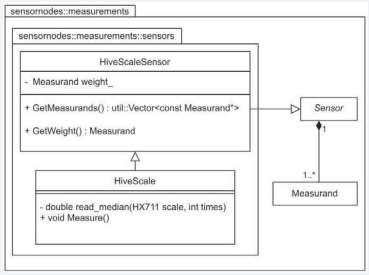


3) GBox with beehive scale

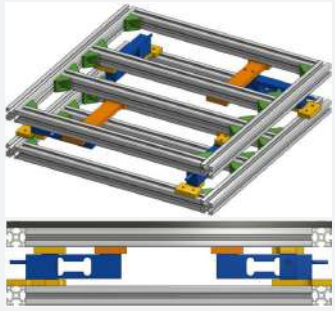


Implementation of the DIY Apiary and Honey Flow Surveillance System

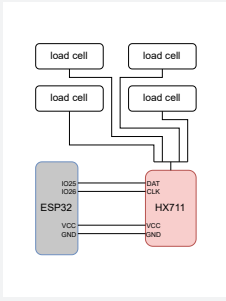
1) Software component: beehive weight sensor



2) Hardware component: beehive scale



3) Wiring diagram



Honey Flow Monitoring

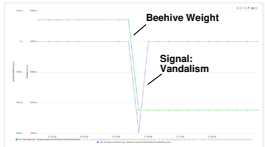
- 200g-corrected
- accumulated over 24 hours
- automated notification

Swarming Event Detection

- sudden weight drop between 250g and 3500g within 60 min
- automated notification

Vandalism Detection

- sudden weight drop
- limit adjustable
- automated notification



Costs and References

Frame	100,00 €
Wooden plates	5,00 €
Metal adapters	15,00 €
4 load cells	200,00 €
Load cell amplifier	15,00 €
Esp32	10,00 €
Housing	15,00 €
Overall costs	**360,00 €**

[1] `www.bienenkunde.rlp.de/Bienenkunde`

[2] `www.guerilla-sensing.de`

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Honey flow information systems (HFIS) like TrachtNet allow the monitoring of honey flow and other honey flow-relevant parameters. Based on this data, beekeepers can quantify the honey production of an apiary and relate it to nearby or remote apiaries or to apiaries operated by other beekeepers. The data also allows identifying counter-productive weather conditions or the lack of adequate food
resources.

Although HFIS provide important information for efficiently managing bees, the availability of and admission to HFIS is quite restricted: the German TrachtNet has in total only about 210 monitored apiaries mainly located in South-Germany. Additionally, participation in TrachtNet is administrative-heavy and requires purchase and operation of only commercially available, cost-intensive, certified scales.

To overcome these drawbacks, we propose an easy-to-implement, low-cost HFIS based on our world-wide and publicly available geo-information system Guerilla Sensing (GS). Using GS, any single beekeeper or group (like a local beekeeper association) can realize a local HFIS or join an already existent HFIS in the GS universe. A participating beekeeper typically adds a so-called "Guerilla Box" (G-Box) to the system. Such a G-Box manages the sensors attached to it and forwards the measured data to the GS platform. At the platform, the data is persisted, visually presented and analyzed. The current system honors privacy, supports honey flow analysis, identifies swarming events, and detects vandalism. If a pre-defined event is detected, the GS-based HFIS, in real-time, sends notifications to single or multiple beekeepers, allowing them to react timely.

Although a wide variety of sensors can be attached to a G-Box, the core component is a beehive scale for monitoring honey flow. We developed a low-budget, high-quality DIY scale that can easily be realized by an average-skilled person. The implementation of a G-Box, serving as functional hub at an apiary, can easily interactively be configured using the GS system. Furthermore, guidance of how to connect the hardware components is given.

All these components put together allow beekeepers to easily implement and operate a local, low-cost HFIS that automatically persists, analyzes and visualizes sensor data like yield, identifies management problems and detects events like swarming and vandalism.