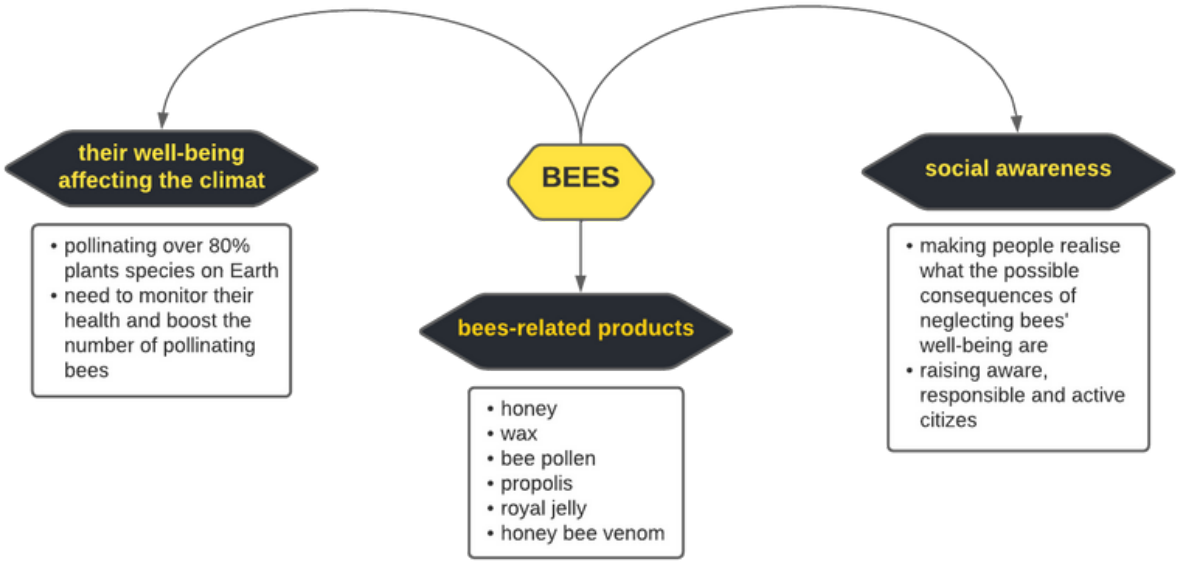
Your well-BEEing

Problematic aspects



Bees in the coutryside environment paradoxically generate less profit than in the city. It is due to the monoculture phenomenon in agricultural surrounding. Growing only one type of plants in the specified area results in vulnerability to the season - you need to move beehives to a different area in which plants are currently shedding pollen. City parks in general are more diverse in this aspect - people do not have a chance to grow acres of one plant type there. Therefore, to use this potential, and idea to place beehives in the cities is proposed.

Important factors that need to be taken into consideration

- weight being an indicator of the number of bees and the amount of bee-related profits (honey, propolis etc.)
- sounds made by the swarm might indicate the atmosphere in the hive (e.g. illness, process of swarming, problems with the queen)
- temperature and humidity
  - they need to be measured at different heights - the temperature difference between hive's top and bottom might even reach 35 degrees of Celsius
  - **temperature and humidity should be mainly indicators of a problem, not a factor to be highly regulated by human** - the real reason of the problem should be solved
- harvesting has to be done in a responsible manner - it cannot be performed constantly

Ideas behind the product

Spreading the beekeeping hobby in cities

- if you want to start beekeeping, it is as easy as buying one of the presented beehives and with that you get a minthly subscription to a professional beekeeper's help via the app and - if needed - in person
- automated harvesting, access to sensoric data and a chat with a professional makes beekeeping more accessible to people

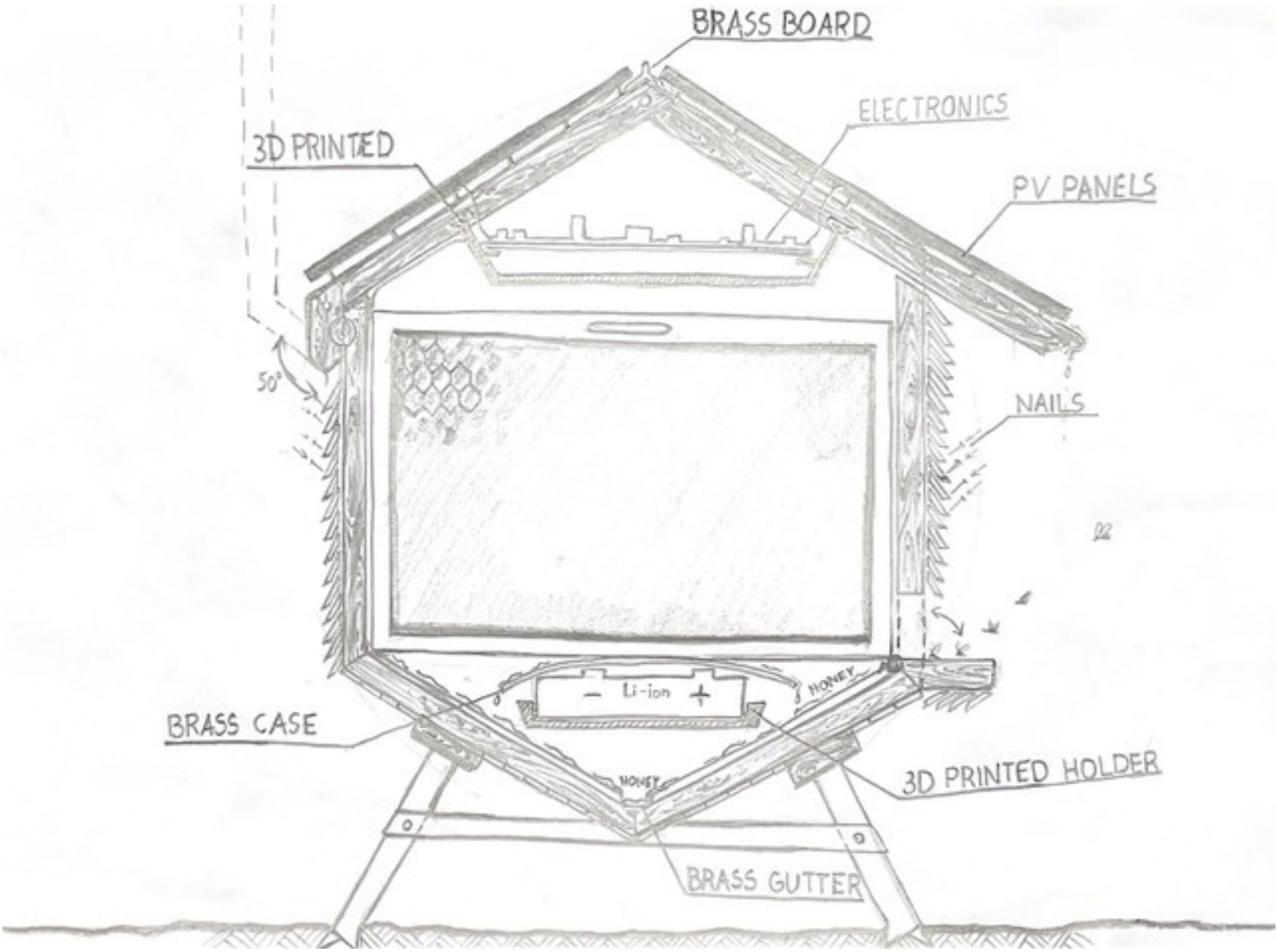
Comfort in beekeeping

- no need to measure every parameter separately with additional devices - the most important measurements are included in the beehive
- remote access to the data in the mobile application

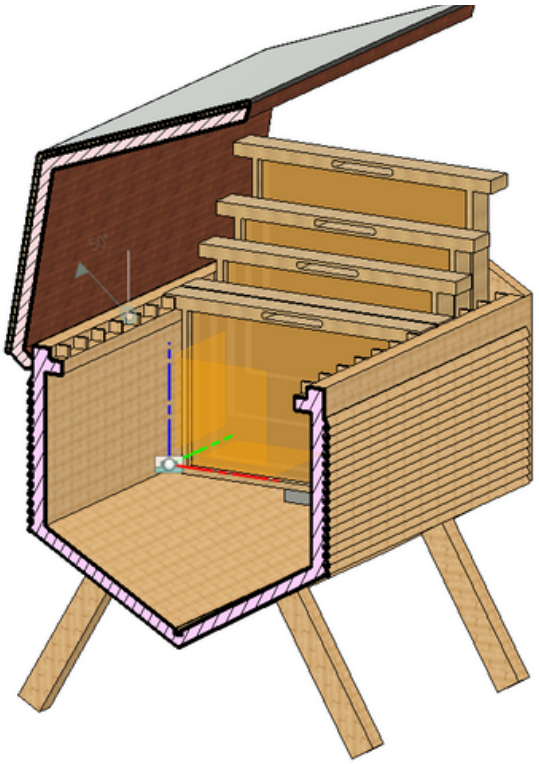
Contribution to bee-related research

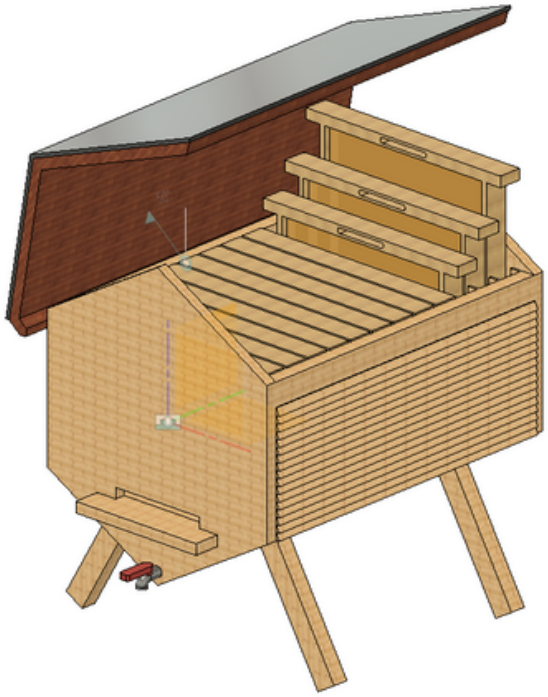
- creating a gloablly available database with sensoric measurements in the beehives and their correlations
- utilising neural networks (multi layered perceptron, recurrent neural networks etc.) for signal analysis - artificial intelligence predicting bees' mood and satisfaction with the conditions in the hive
- analysis of chemical components in the beehive as a part of R&D
    - not explored greatly and being a possibility to start a research cooperation with Wroclaw University of Science and Technology and with Wroclaw University of Environmental and Life Sciences

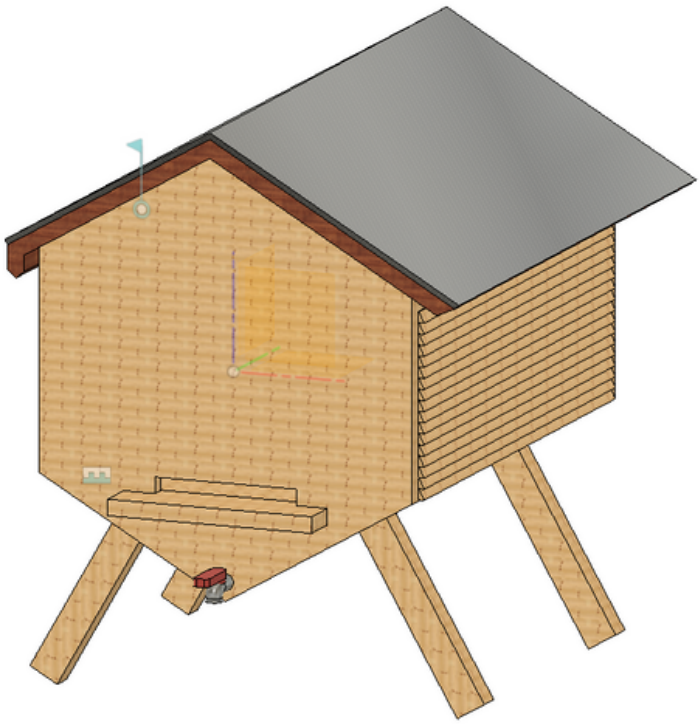
Prototype


BRASS BOARD
ELECTRONICS
3D PRINTED
PV PANELS
50°
NAILS
Li-ion
HONEY
HONEY
BRASS CASE
3D PRINTED HOLDER
BRASS GUTTER

Prototype

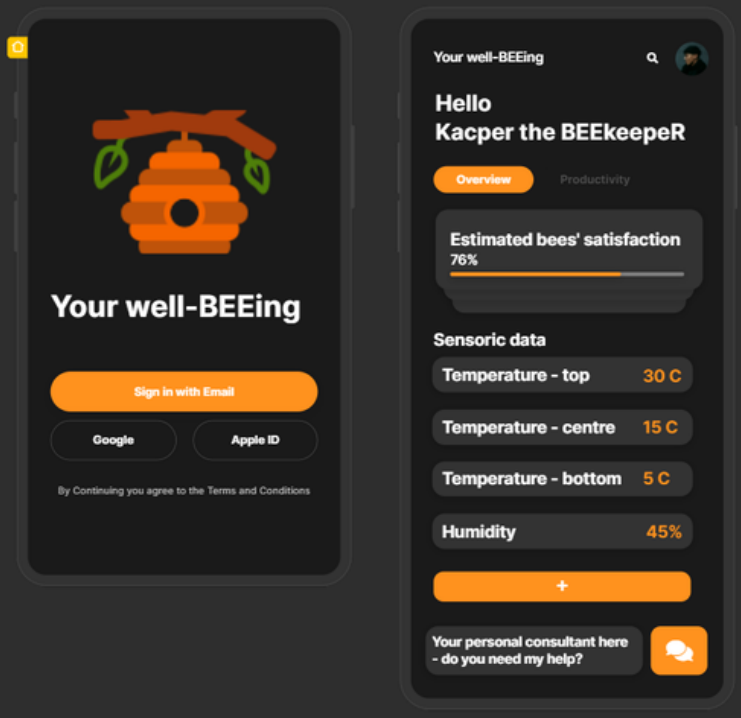






Product specification

- 70 cm x 70 cm x 60 cm
- solar-powered
  - MPPT regulator for charging batteries in the system
  - Li-Ion battery system
- strain gauge on the hive's bottom for measuring weight
  - strain gauge NA27
- humidity and temperature sensor at three levels - top, bottom and centre
  - BME280
- chemical sensors
  - ZE08-CH20
- microphones for sound recording
  - an array of six MP34DT01
- automated harvesting tap (after the beekeeper's approval in the app based on the bee swarm condition)
- low power heating system
- wireless technology for remote access to sensoric data
  - WiFi with a connection to cloud data processing
- connection to mobile application
  - available on both Android and iOS



References

1. **Pszczoły i ludzie**, Irena Gumowska, 1987, ISBN: 8322501218
2. **ABC pszczelarza**, Józef Kalinowski
3. **Zakładamy pasiekę**, Leon Bornus
4. **Higiena w pasiece**, Barbara Tomaszewska
5. Howard, D. & Duran, Olga & Hunter, Gordon & Stebel, Krzysztof. (2013). **Signal processing the acoustics of honeybees (APIS MELLIFERA) to identify the "queenless" state in Hives**. Proceedings of the Institute of Acoustics. 35. 290-297.
6. **Audio signal processing by neural networks**. Uncini, Aurelio. (2003). Neurocomputing. 55. 593-625. 10.1016/S0925-2312(03)00395-3.
7. Our team member **Kacper Chmielewski**'s four years experience in practical beekeeeping