**FutureIOT**

Goals of the Subproject on Soil Monitoring

Demonstrator #1

The aim is to develop IoT measurement nodes which record and evaluate continuously and spatially resolved soil parameters at the plants, i.e. in the rooted soil layer. The differentiation of the nutrient analysis is performed by electrochemical sensor technology, in particular using the combination of nitrate- and ammonium sensors.

The sensors are used in a mobile laboratory to be developed. A later integration with sensor nodes is based on the compiled basics.
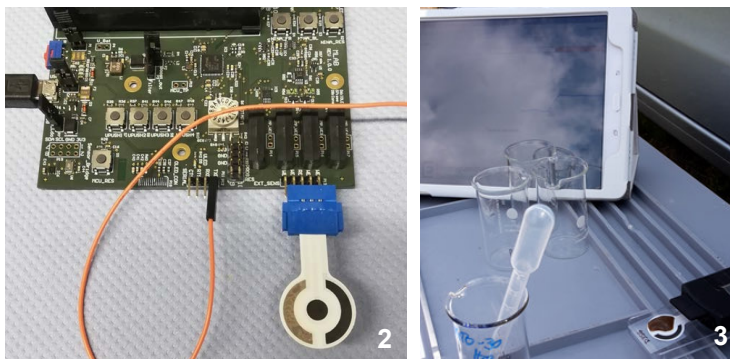
Application relevant demonstrator for the direct analysis of elutriated soil samples

Demonstrator #2

A further goal of the subproject is the wireless integration of ground-buried sensors with an IoT environment. The system allows for storage and handling of real-time data of humidity and temperature. Information is transferred by means of Low Power Wide Area Network (LPWAN) technology and interpreted as well as made available on the IoT platform for further analysis.

Demonstrator for radio transmission from the ground

The FutureIOT consortium focuses its research activities on two distinct fields of action.
»City.digital« und »Agriculture.digital«

Research Network FutureIOT

WP leader Soil Monitoring

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1 - Reasearch partners, 2 - Preversion demonstrator (Fraunhofer IISB©), 3 - Measurement in elutriated soil samples for determination of ammonium and nitrate ions in soil (Fraunhofer IISB©), 4 - Minimized IoT sensor network MIOTY® (Fraunhofer IIS©), 5 - Soil Moisture, Temperature, and Electrical Conductivity Sensor (METER Group ©)

Smart Networks for Cities and Agriculture

Soil Monitoring

IOT

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AGRICULTURE.DIGITAL

Subproject 3: Soil Monitoring

The subproject Soil Monitoring deals with the research on technology and application of future IoT systems for the use in digital agriculture. The background to this is the locally optimized cultivation of fields on small scale, which needs to include locally collected sensor data on plant condition or soil quality in addition to global data such as weather history or forecast.

This subproject specifically addresses questions concerning the implementation of an IoT-supported soil analysis. Cost-effective electrolyte sensors based on printing techniques, developed in the Center of Excellence Electronic Systems LZE (Fraunhofer IIS and IISB), are adapted to the requirements of soil analysis, especially in regard to specificity and robustness. A mobile measuring system is established, which can be used for the analysis of critical ground parameters directly on the field and connects via wireless or mobile communication technologies to the IoT platform.

Buried soil sensors for humidity and temperature measurements transfer the data using LPWAN technology. Together with industrial partners, selected sensor components are integrated, focusing on electronics and software development.

Consortium of subproject Soil Monitoring

Industrial partners:
- BayWa AG
- STEP Systems GmbH
- METER Group AG
- IR Systeme GmbH & Co.KG
- Department for Food, Agriculture and Forest Fürth, AELF (ass. P.)
- Bavarian State Research Center for Viniculture and Horticulture, LWG (ass.P.)
- Dennis Balasus (ass.P.)
- Software AG (ass.P.)
Research partners:
- Fraunhofer Institute for Integrated Systeme and Device Technology IISB
- Coburg university of applied sciences and arts, Departmennt of Electrical Engineering and Computer Science
- Friedrich-Alexander-University Erlangen-Nuremberg, Information Technology with a focus on Communications Electronics, LIKE
- Technical University of Munich, Chair of Security in Information Technology, EISEC

AREAS OF ACTIVITY AND OBJECTIVES OF THE RESEARCH NETWORK

Aim of the FutureIOT research network gathering more than 30 partners from industry and research, is the joint development of comprehensive IoT solutions for practice-oriented solutions in the thematic fields »City.digital« and »Agriculture.digital.

Further development and integration of individual technologies in the areas of communication, sensor technology, localization, information security, and IoT platforms, are intended to master the existing challenges in the city as well as on the countryside.

In agriculture, the use of fertilizers can be improved by an IoT-supported soil analysis and animal management can be enabled also outside of the stable on meadows and alpine pastures.

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The resulting application focus allows for development and validation of solutions for the individual technical elements of the FutureIOT research project on the background of highly practice-oriented requirements, while at the same time demonstrating the potential created by further development and combination of the individual technologies for practical use. The expertise available in the network enables the development of complete IoT solutions ranging from the sensor up to the open IoT platform incl. application specific user interfaces.

Cross-sectional topics in the consortium

The FutureIOT research network is characterized by five cross-cutting topics - the Centers of Competence (CoC):
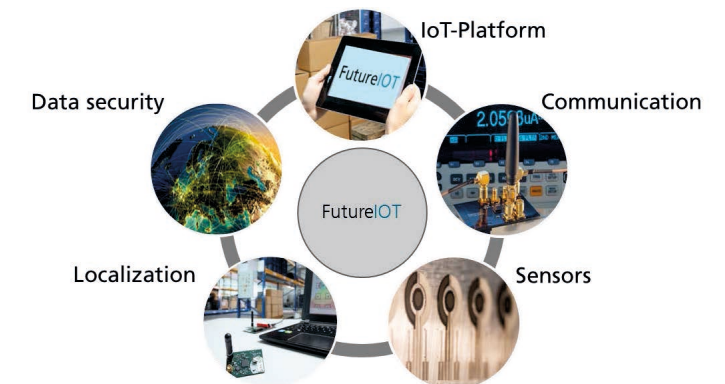
These CoCs build on already existing knowledge, know-how and a network of experts corresponding to the respective areas and form, due to their overarching function, the technical foundation for a target-oriented further development within all activities of the research association as well as for a synergetic know-how transfer within and between the subprojects.

FUNDING