



# **Intelligent Irrigation System for Low-cost Autonomous Water Control in Small-scale Agriculture**

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## **IIWA short technical description**

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Version: 1.0

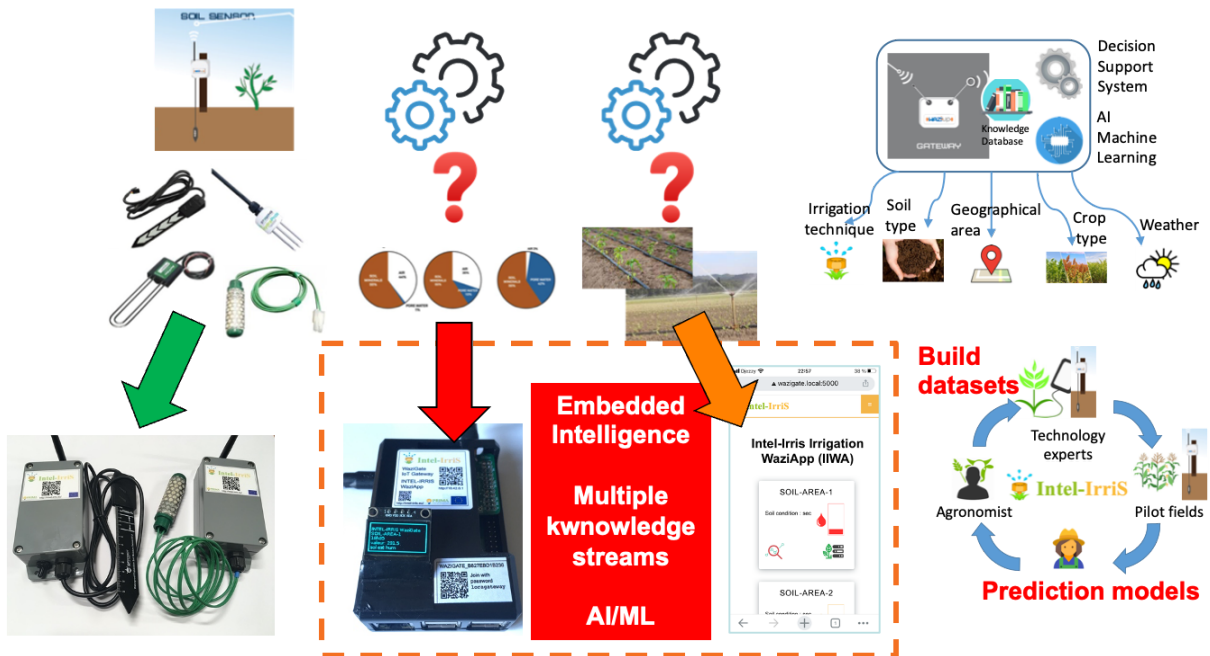
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# 1.IIWA

IIWA stands for “INTEL-IRRIS Irrigation WaziApp”. It is a web application that runs on the WaziGate (the IoT gateway) to add advanced calibration and soil/plant/weather parameters. IIWA will then try to provide accurate soil condition and irrigation indications.

It is still under development and currently IIWA provides a framework where more advanced processing and intelligence could be easily added.



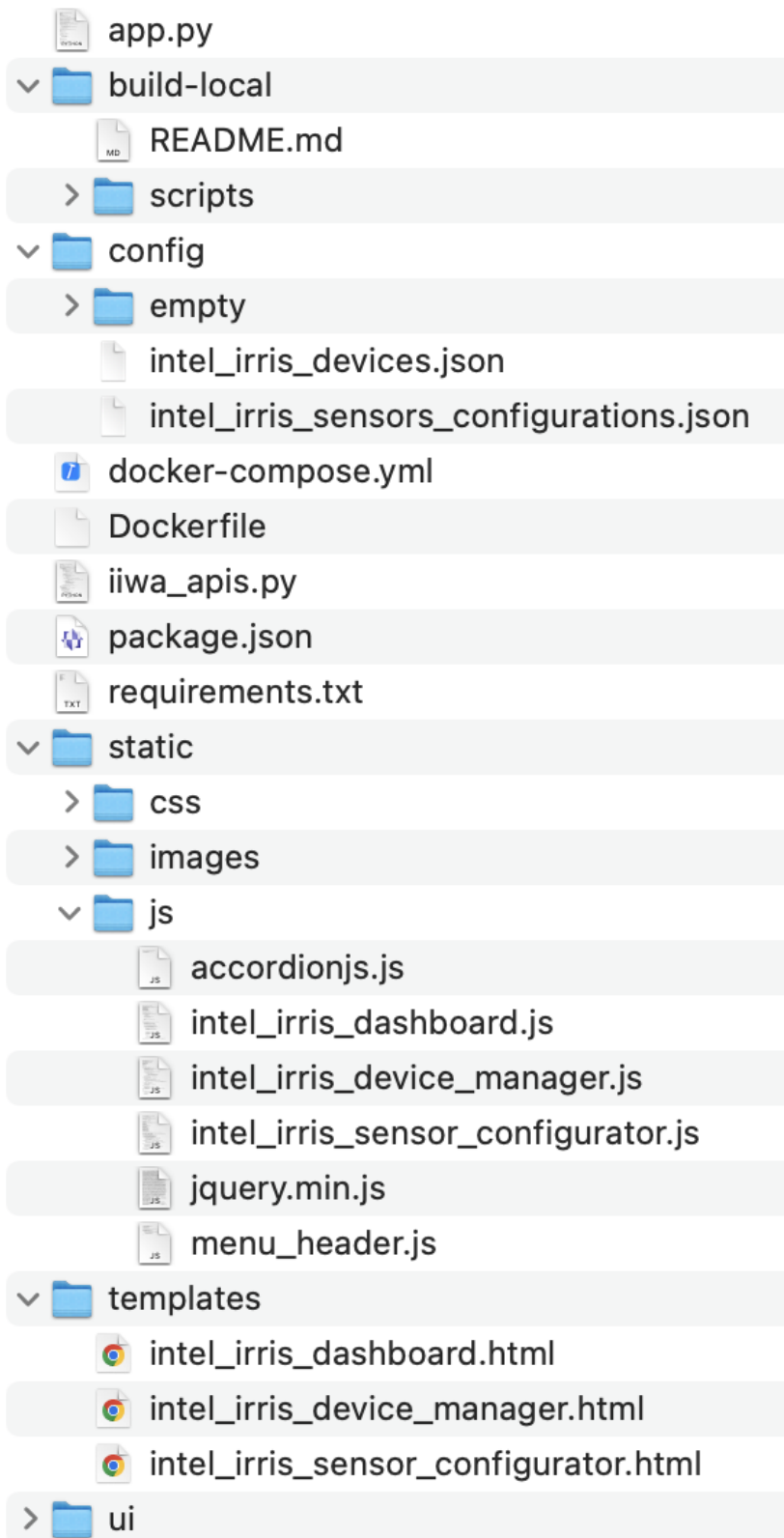
This soil sensor could be either a simple capacitive sensor (DF Robot SEN0308, left figure) or a tensiometer (Irrrometer WATERMARK 200SS, right figure). The INTEL-IRRIS starter-kit provides a default configuration where 2 default devices are defined: one capacitive and one tensiometer.



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## 2. ARCHITECTURE

IIWA is written in Python+Flask framework. There are also Javascript codes to interact with HTML pages. The main files and components are illustrated below:



- app.py is the main python program
- iiwa\_apis.py implements main IIWA functions and also provides an HTTP REST API
- .js files provides the Javascript code to interact with the HTML pages
- the .html template files define the various IIWA screens
- config folder contains the current files and the empty configuration file templates
- for the INTEL-IRRIS coding challenge, the build-local folder contains the instructions to install and run IIWA on a host computer for development

## 3. CONFIGURATION FILES

There 2 configuration files:

1. intel\_irris\_devices.json
2. intel\_irris\_sensors\_configurations.json

### 3.1. intel\_irris\_devices.json

intel\_irris\_devices.json contains the list of devices added to IIWA. The starter-kit configuration contains 2 default devices: one capacitive and one tensiometer. Below is an example for such a configuration:

```
[
  {
    "device_id": "6444fcfd68f31909e6d04fd0",
    "device_name": "SOIL-AREA-1",
    "sensors_structure": "1_capacitive"
  },
  {
    "device_id": "6444fd0068f31909e6d04fd5",
    "device_name": "SOIL-AREA-2",
    "sensors_structure": "1_watermark"
  }
]
```

### 3.2. intel\_irris\_sensors\_configurations.json

intel\_irris\_sensors\_configurations.json contains the advanced parameters for all soil humidity sensors from all devices that were added to IIWA. The starter-kit configuration contains 2 default devices: one capacitive and one tensiometer. Below is an example for such a configuration where device "6444fcfd68f31909e6d04fd0" with logical sensor id "temperatureSensor\_0" is a capacitive sensor and device "6444fd0068f31909e6d04fd5" with logical sensor id "temperatureSensor\_0" is a tensiometer sensor. In the latter case, device "6444fd0068f31909e6d04fd5" also has a soil temperature sensor with logical id "temperatureSensor\_5" which will provide the soil temperature value in real time.

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```
{
  "globals": {
    "soil_salinity": "undefined",
    "soil_bulk_density": "undefined",
    "soil_field_capacity": "undefined",
    "weather_region": "undefined",
    "weather_weekly_evaporation": "undefined",
    "weather_weekly_pluviometry": "undefined"
  },
  "sensors": [
    {
      "value": {
        "sensor_type": "capacitive",
        "sensor_age": "0",
        "sensor_max_value": "800",
        "sensor_min_value": "0",
        "soil_type": "silty",
        "soil_irrigation_type": "furrow",
        "soil_salinity": "undefined",
        "soil_bulk_density": "undefined",
        "soil_field_capacity": "undefined",
        "plant_category": "undefined",
        "plant_variety": "undefined",
        "plant_planting_date": "undefined",
        "weather_region": "semi-arid",
        "weather_weekly_evaporation": "undefined",
        "weather_weekly_pluviometry": "undefined",
        "last_value": 0
      },
      "soil_temperature_source": {
        "soil_temperature_device_id": "undefined",
        "soil_temperature_sensor_id": "undefined",
        "soil_temperature_value": "undefined"
      }
    }
  ]
}
```

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```
    },
    "device_id": "6444fcfd68f31909e6d04fd0",
    "sensor_id": "temperatureSensor_0"
  },
  {
    "value": {
      "sensor_type": "tensiometer_cbar",
      "sensor_age": "0",
      "sensor_max_value": "124",
      "sensor_min_value": "0",
      "soil_type": "silty",
      "soil_irrigation_type": "furrow",
      "soil_salinity": "undefined",
      "soil_bulk_density": "undefined",
      "soil_field_capacity": "undefined",
      "plant_category": "undefined",
      "plant_variety": "undefined",
      "plant_planting_date": "undefined",
      "weather_region": "semi-arid",
      "weather_weekly_evaporation": "undefined",
      "weather_weekly_pluviometry": "undefined",
      "last_value": 0
    },
    "soil_temperature_source": {
      "soil_temperature_device_id": "6444fd0068f31909e6d04fd5",
      "soil_temperature_sensor_id": "temperatureSensor_5",
      "soil_temperature_value": "undefined"
    }
  },
  "device_id": "6444fd0068f31909e6d04fd5",
  "sensor_id": "temperatureSensor_0"
}
]
}
```

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