Smart Watering of Trees – an IoT solution with an easy-to-use app

Company information
At Grybb – part of Curious Inc – we care about our surroundings. Therefore, we've built state of the art software which enables smooth service management for objects in public areas, mostly underground garbage containers. In short, we make assets last longer and reduce costs by smart service planning. This is part of our mission to contribute to a more sustainable planet.

Motivation/Background
Care for the environment has shifted from global ideas to legislation. Nearly all municipalities have to take measures in order to comply to -for example- the agreement of Paris 2030. However, a lot of IT systems within municipalities are complex and not agile enough to cope with this paradigm shift. That's where we join the party!

Since we already service more than 70.000 underground containers[1], we want to expand to other markets. Currently we are exploring other objects in the public space, of which **'smart watering of trees'** is where we need your brainpower.

Problem description
Local governments are bound to make new cityparts a lot greener. This includes planting new trees. Unfortunately, due to extreme hot summers, a lot of freshly planted trees die within 3 years and have to be replaced by the municipality. This percentage rose from 4% to 20%. Technical solutions to hold the water more efficiently (tree diaper / plastic boundaries around trees) are already implemented, however additional watering still must be carried out. To put things into perspective; only 10% of the water that is being given to a tree is effectively taken by the tree.

We can end this tragic trend by smart watering. The idea is simple. A sensor is placed in the soil measuring the current water levels close to the tree. Practically, this may mean to have one sensor per every three to four trees. This data can be accumulated and combined with weather data (after all, if it starts raining, maybe we don't have to water the trees extra).

Product description
Your objective is to design a web application that can be used to keep track of the status of trees, including (1) tree attributes (e.g., tree number, species name, tree type, tree height, plant year, etc.), (2) watering (e.g., last watering timestamp, water level, planned next watering moment, person that watered, etc.), (3) (fictive) sensor data (e.g., temperature, humidity, etc.), (4) one external data source (e.g., groundwater level, weather forecast, etc.), and (5) additional notes.

Think also of having some traffic lights per tree, indicating real-time attributes of relevance to different users. Users could be (1) municipalities, (2) gardeners, or (3) citizens, but also (4) other stakeholders (e.g., researchers, NGO's or companies that would like to get access to the data – for example through exports or APIs).

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[1] https://vimeo.com/504139878 (introduction Grybb; in Dutch)

We expect you to MVP a first algorithm that determines which trees are in need of watering. The status of trees should be, to some degree, incorporated. For example, a heuristic can be based on business rules such as (1) select region X, (2) select all trees of type Y, (3) select the tree with the lowest estimated water level and include this one in the trip. Consequently, this trip can be extended by (4) a nearest insertion step, until a threshold is reached (e.g., time duration passed or water tank of the gardener is empty). The product will form an important input for our service planning module.

To give you some guidance, we expect you to also make some design choices. However, the following features/design choices should be incorporated:
1. User friendly (focus = tablet + desktop).
2. The objects should be shown on a map, including clustering.
3. A method which determines when a tree needs additional watering (e.g., traffic light that changes over time).
4. The registration of the watering should be a 'one-click' experience.

As you can imagine, stakeholders may favor a different view on the application. It is up to you to prioritize and focus on one or more of the mentioned stakeholders.

Nice to have (bonus):
5. Mobile friendly.
6. Integration with actual sensor data.
7. Easy integration with Grybb software (via an API).
8. Integration with other (open) data sources.
9. For the rest, think about yourself using this product, which features would you like to have? Some inspiration keywords: pesticides, insects, and birds.

Some background links:
- https://maps.amsterdam.nl/bomen/?LANG=en
- https://maps.amsterdam.nl/afvalcontainers/

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