D12
Documentation of Prototypes

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ESR 4 - Smart Cities

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Contents

This file contains documentation about the prototypes developed during the second year of PhD research focusing on waste prevention and smart cities within the OpenDoTT project.

The prototypes were conceived as trial implementations of two concept ideas created in the course of the research. Both concepts (“Universal Registry of Things”, and “Point and Reuse”) discuss the potential uses of technology to promote a greater reuse of discarded objects and materials in cities and regions.

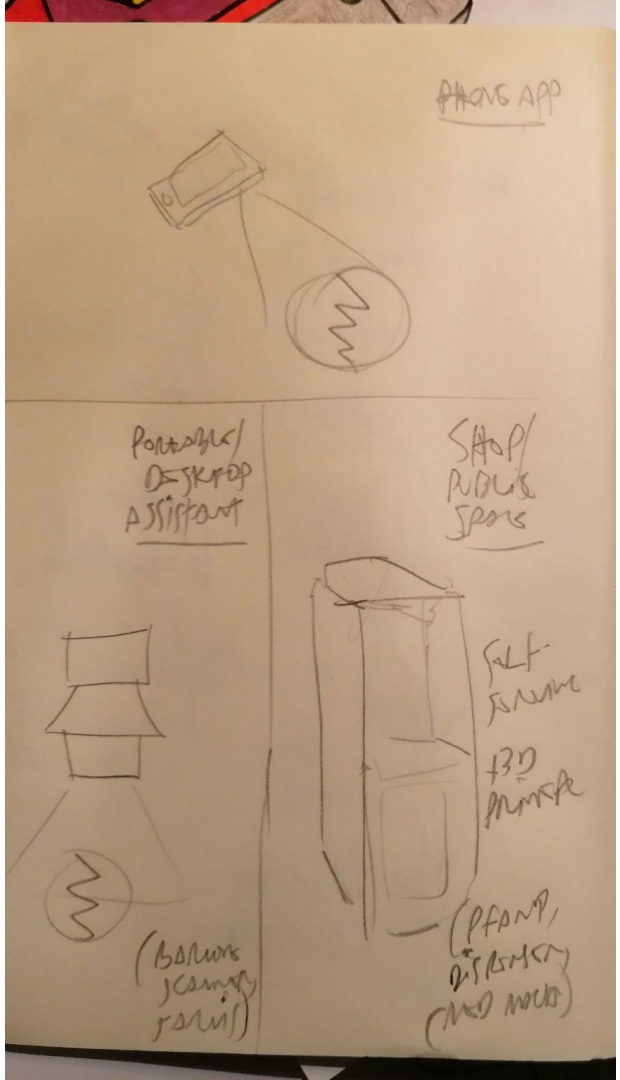
E-I

Concept

E-I, short for Evaluation Interface, is a combination of speculative technologies conceived to help society reuse discarded materials.

Its main purpose is allowing users to assess the potential value of materials.

E-I does that by identifying objects and parsing them against an open database with information relevant for evaluating and reusing said objects.



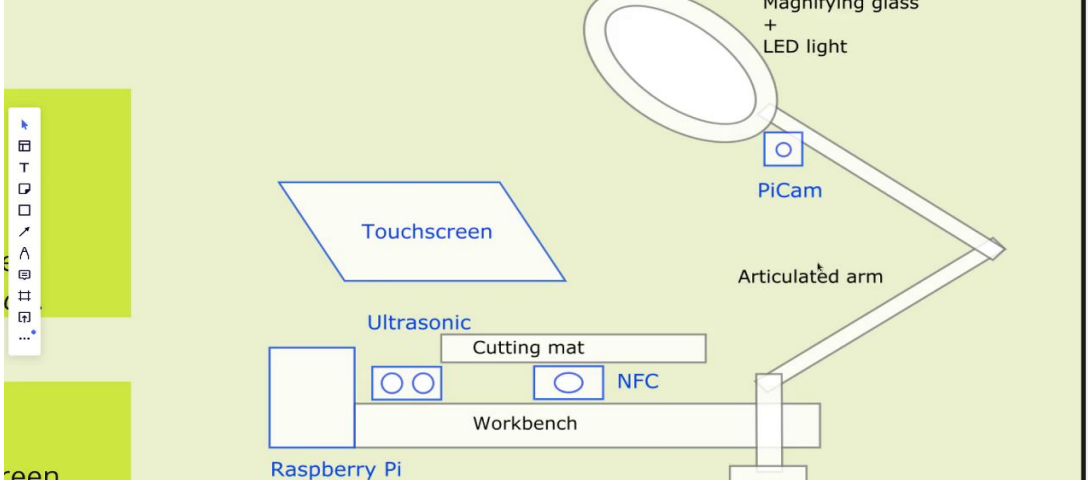
E-I can be deployed in different form factors: an app for mobile devices; a workbench equipment; or even a larger version shaped as a kiosk or vending machine.

For the purposes of research prototyping, the workbench version was chosen.

Features

The expected behaviour of the workbench version of E-I is designed around the steps below:

1. The user asks E-I about a specific object in one of the following ways:
    - placing the object on E-I,
    - typing a search query into a keyboard in its touchscreen, or
    - asking E-I about the object.
2. E-I compares images and other information collected from the product/object (weight, colors, barcode, QR code) against an open database of things
3. When information about the object is found, E-I retrieves it and delivers to the user via screen or voice.
4. When information about the object is not found, E-I allows the user to input it via keyboard or voice.

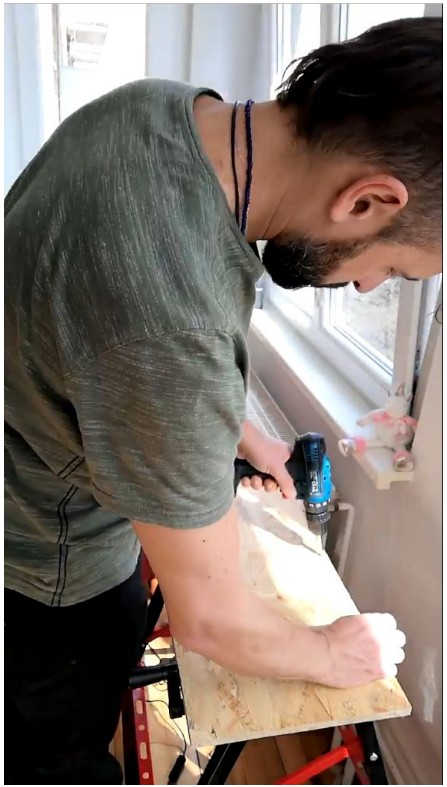


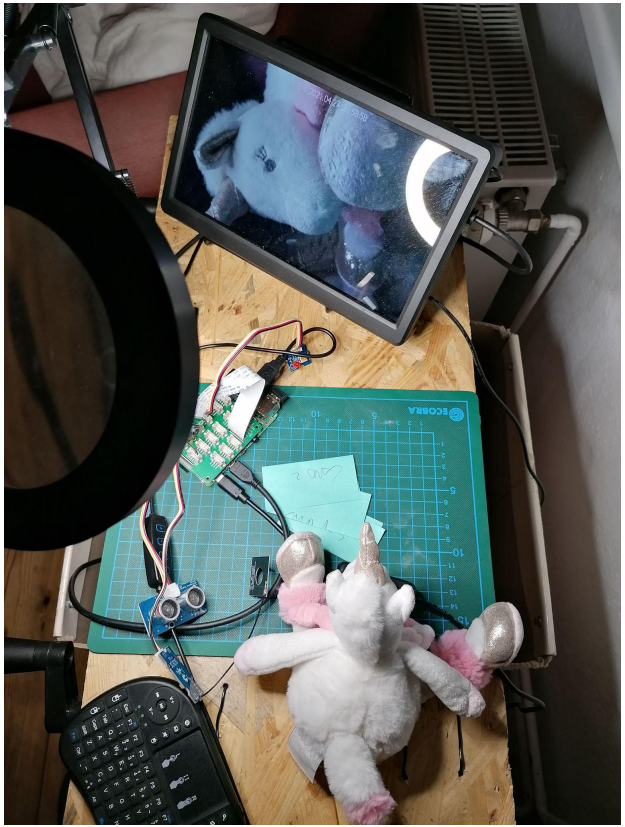
Prototyping

The speculative prototype of E-I consists of the following:

1. An articulated arm is attached to a workbench with a cutting mat.
2. A proximity sensor (ultrasonic), a NFC reader, a video camera and a touch screen are attached to a Raspberry Pi.
3. When an object is put in the mat, the screen turns on. The image of the object is shown in a window.
4. Some predefined objects have a NFC tag. When these are recognised, the screen shows information about then.
5. When the object is not identified, the user can press a button and input information about it.

Workbench E-I

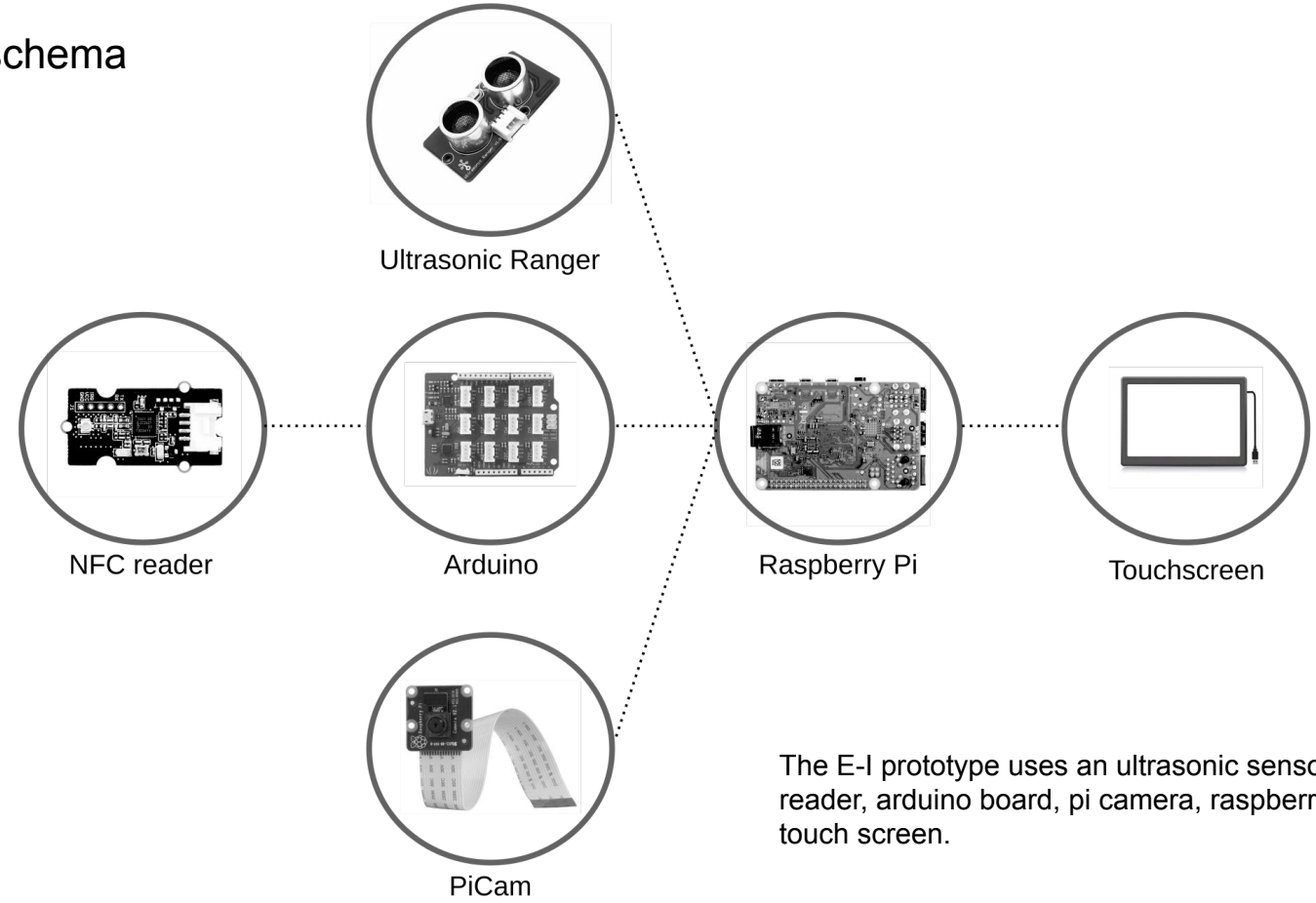




The goal of this prototype is not to develop a functional product, but experiment with speculative use cases. The idea is to devise technologies that might promote the reuse of a larger proportion of goods and materials.

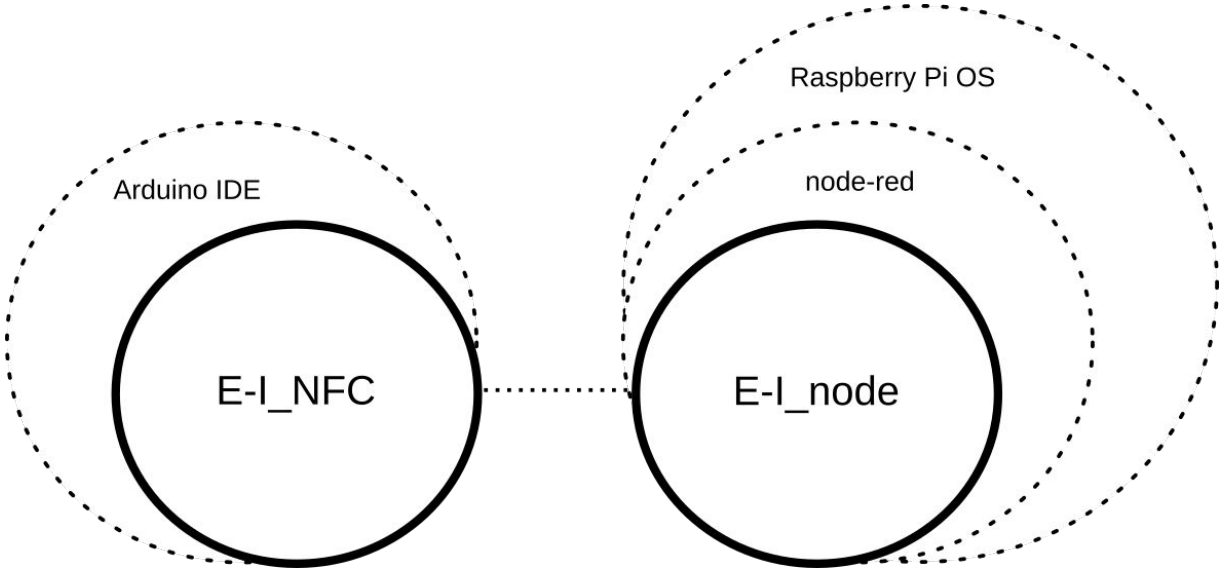
Other points of discussion are what would the implications of such technologies be in terms of use, privacy, health and safety, policy and economy.

Hardware schema



The E-I prototype uses an ultrasonic sensor, NFC reader, arduino board, pi camera, raspberry Pi and a touch screen.

Software



The NFC reader is attached to the arduino board and sends its readings via USB to the Raspberry Pi running the Debian based Raspberry Pi OS.

The Raspberry Pi board has node-red running locally, to which the camera and the ultrasonic sensor are connected. It displays information using the node-red dashboard module.

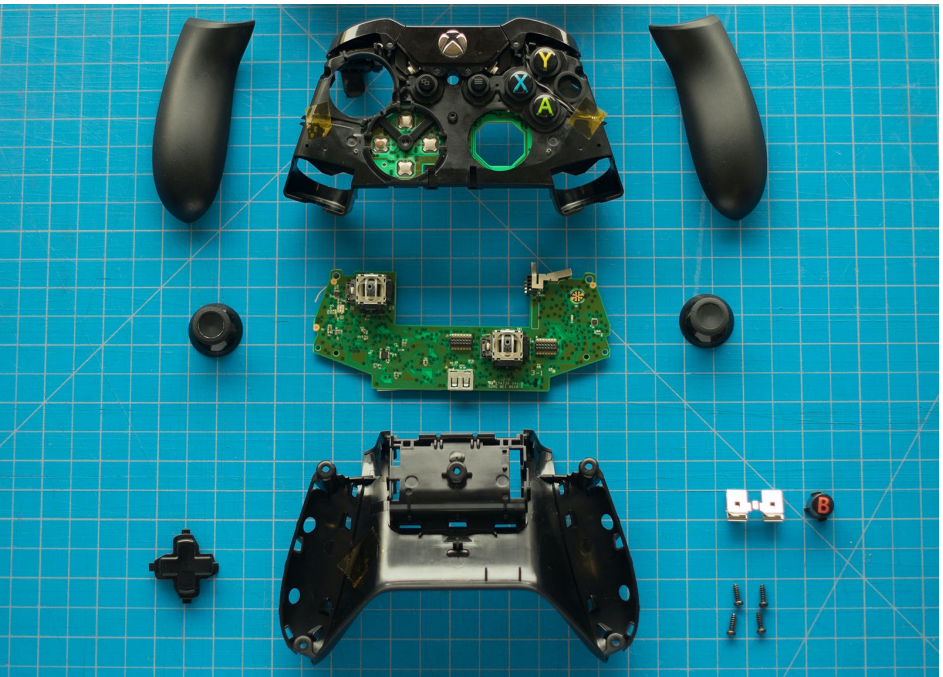
Complete documentation about this prototype can be found in the project repository:

https://github.com/opendott-smartcities/II/tree/main/D12_documentation-of-prototypes/e-i

ThingWiki

Original concept

The Universal Registry of Things is a dynamic source of information about the value and reusability of goods and materials. It is connected to third-party data sources and uses AI to normalise them and make data available through open protocols.



ThingWiki is an experimental implementation of the Universal Registry of Things. The prototype is a website with information about a sample of different kinds of objects. It is designed to be easy to navigate and access by users, whilst enabling raw data and its structure to be exchanged and reused by information systems.

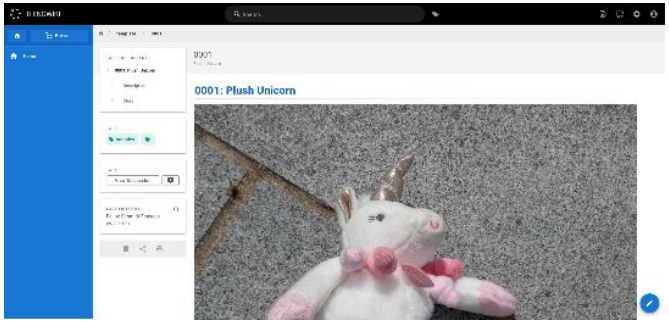
ThingWiki triggers important conversations about the reliability, governance and permanence of data.

ThingWiki is live on https://thingwiki.cc

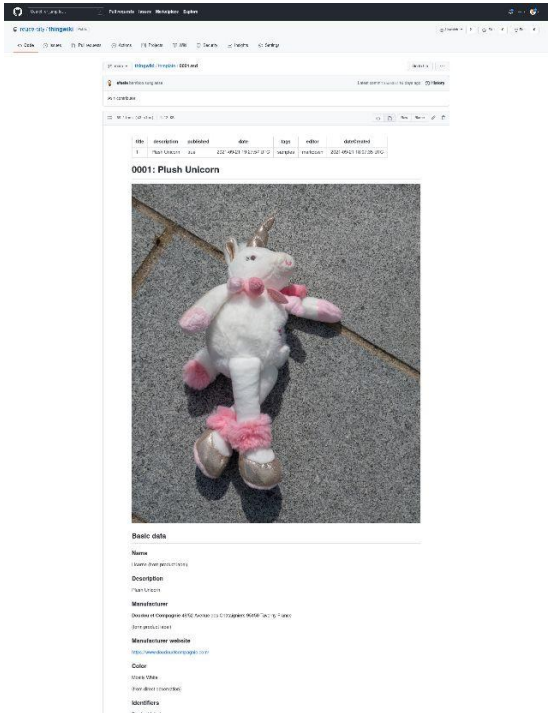
Software

ThingWiki uses the wiki engine Wiki.js to render a website with individual pages for discrete objects.

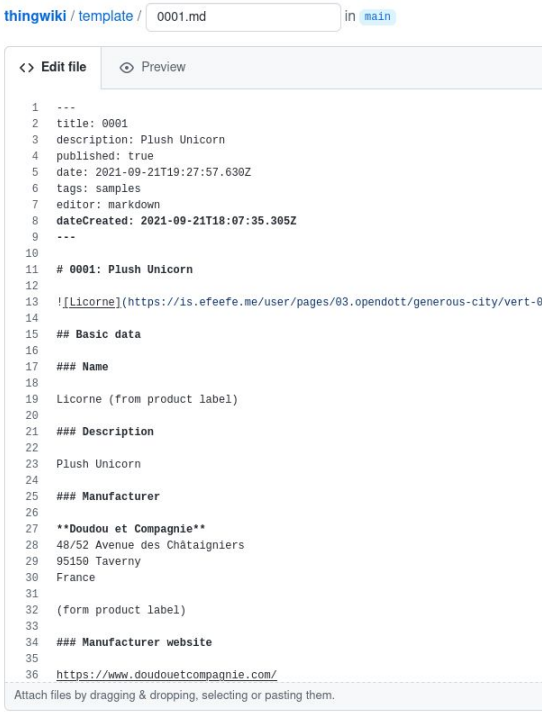
The prototype uses a common template for the entries. Each thing can be associated with others, and tags can be created to organise entries in categories.



All the contents of the wiki are stored as plaintext markdown files. Synchronization with a public git repository provides automatic backup and universal availability of data.



Both manual as well as automated editing are possible, making the data extensible and reusable.



Complete documentation about this prototype can be found in the project repository:

https://github.com/opendott-smartcities/II/tree/main/D12_documentation-of-prototypes/thingwiki