COMPUTER NETWORKS LABORATORY
Department of Computers and Informatics
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TECHNICAL UNIVERSITY OF KOŠICE

Measurement of Water Consumption based on Image Processing

Utilization of image processing for estimation of real time water consumption and possible leakage situations

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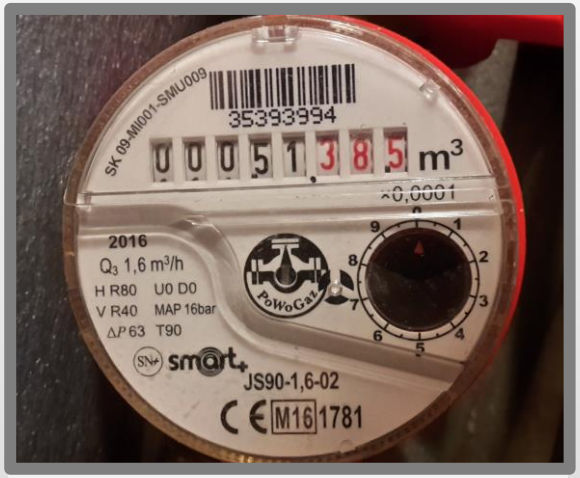
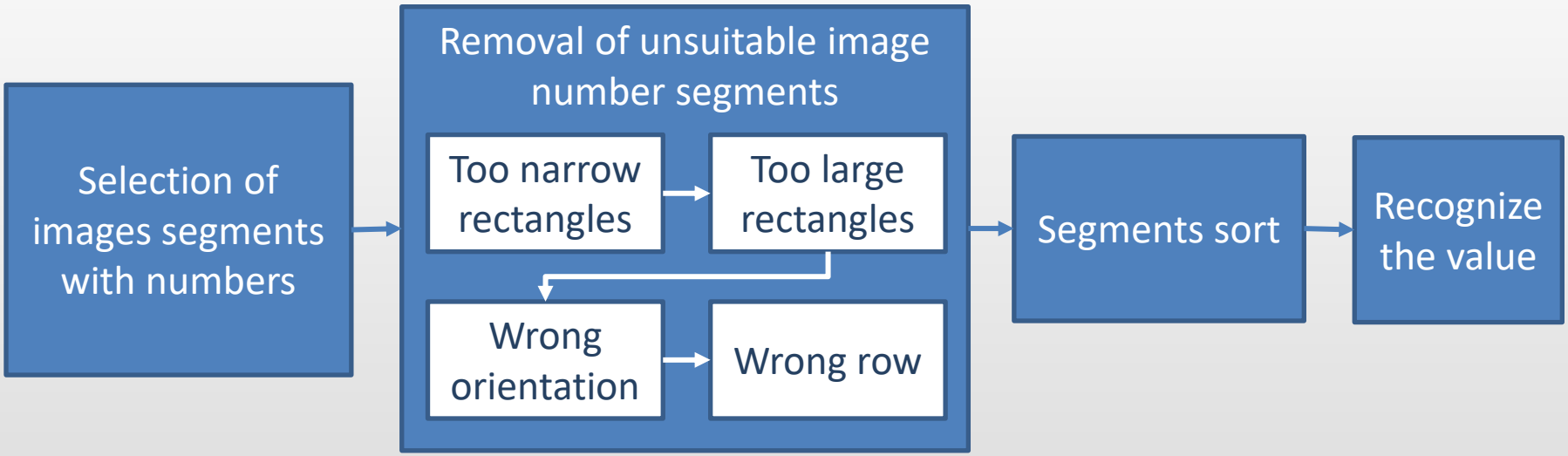
Research goals

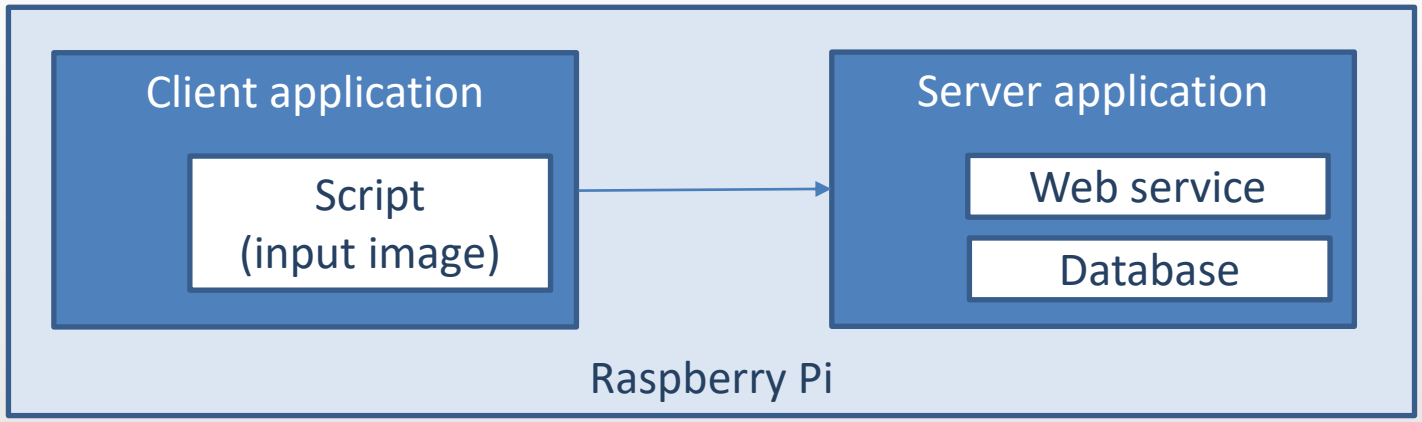
- State-of-art in detection and recognition techniques of Arabic numbers
- Deploy and test specific algorithm for detection of nonstandard situations
- Propose the hardware prototype for visual reading from the meter
- Implement and test software and experimental hardware

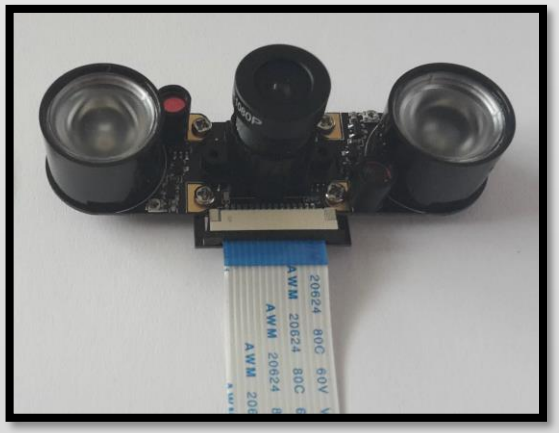


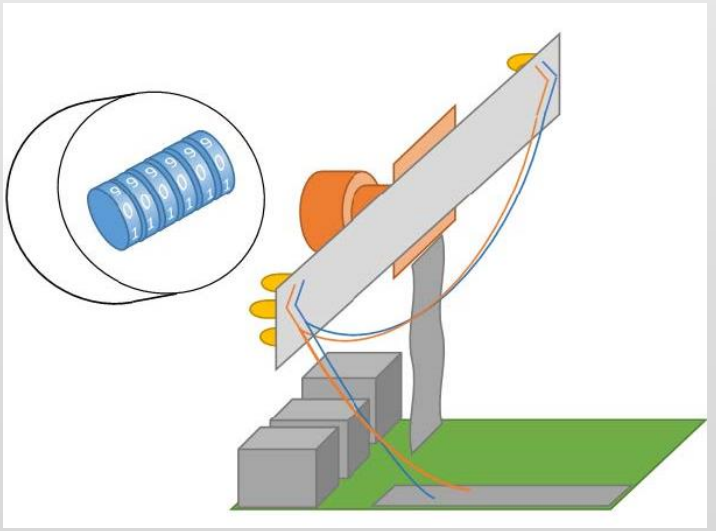
Proposed algorithm for detection of numbers



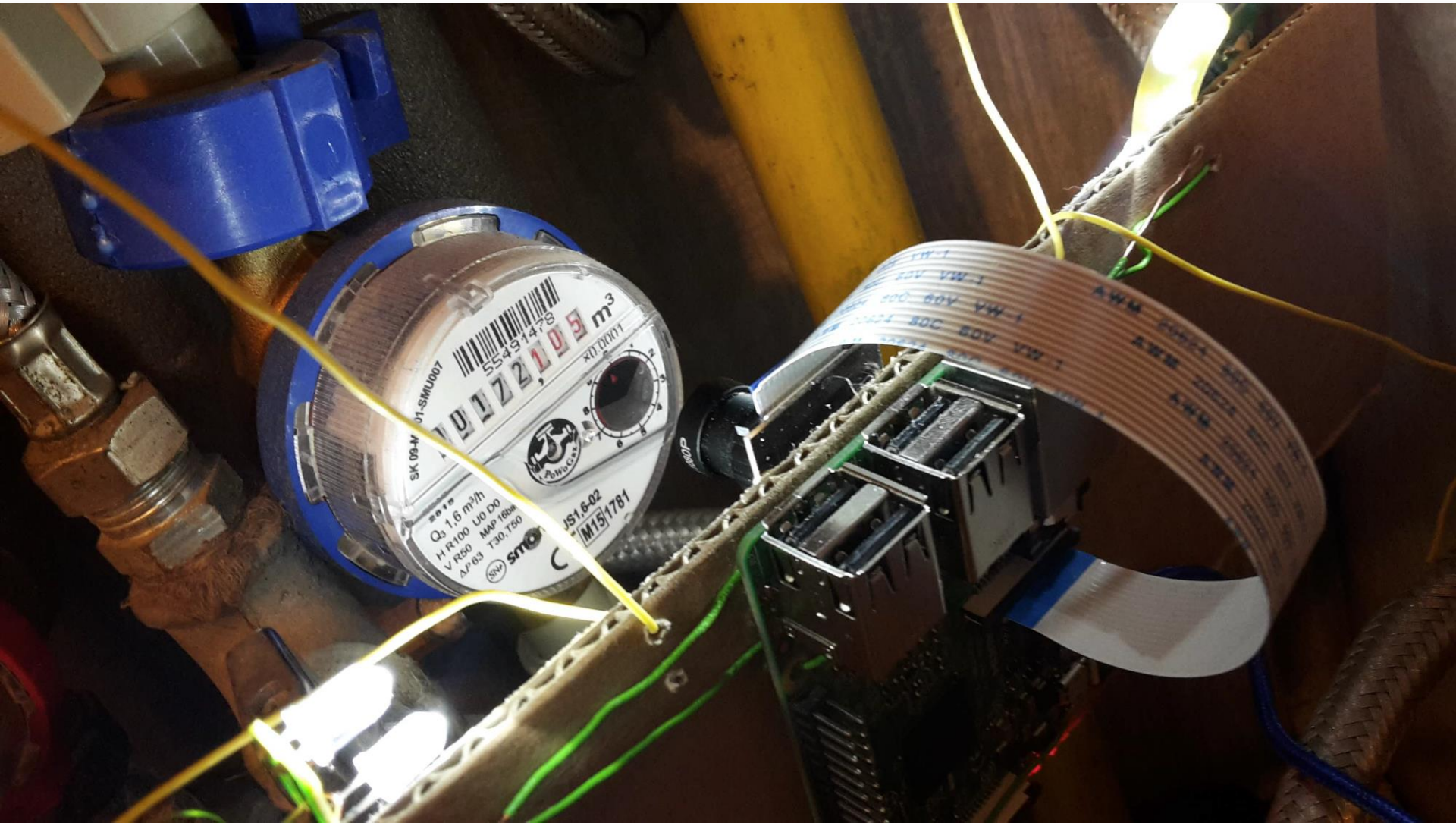
On the hardware







Experimental solution I.



Experimental solution II.

Web interface

Webové rozhranie aplikácie pre detekciu únikov vody

Nastavenia

Hodinová spotreba, o ktorej prekročení chcete byť informovaný.

100

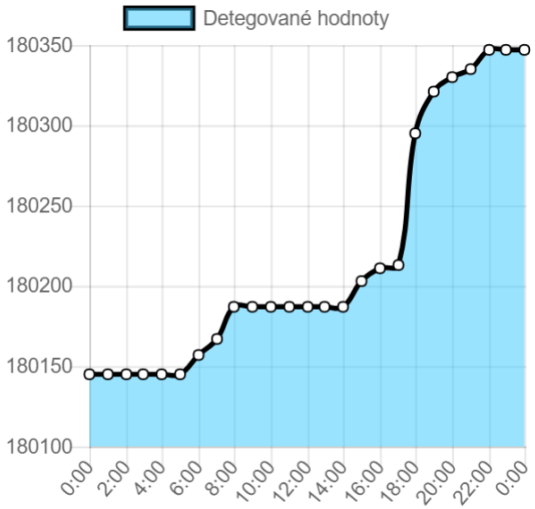
Začiatok najdlhšieho časového intervalu, kedy nespotrebovávate žiadnu vodu.

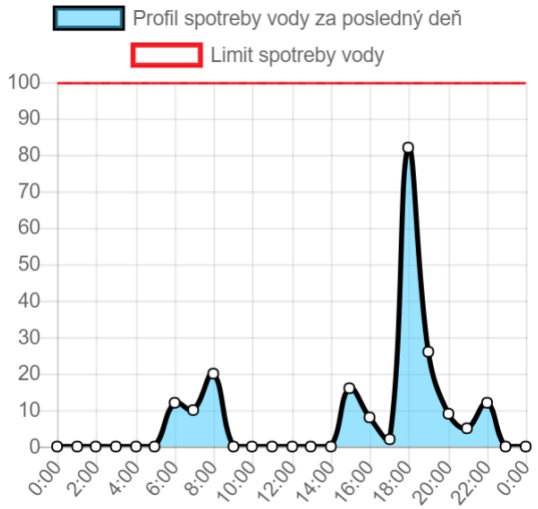
23:00

Koniec najdlhšieho časového intervalu, kedy nespotrebovávate žiadnu vodu.

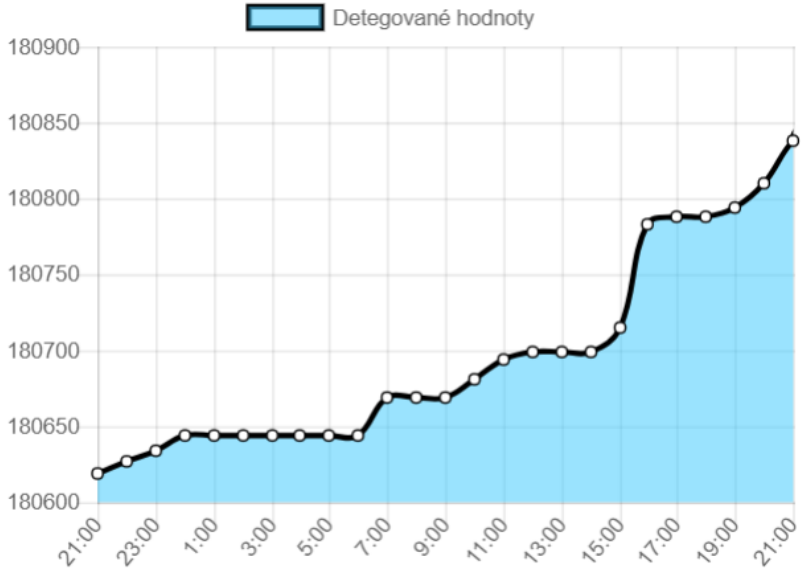
5:00

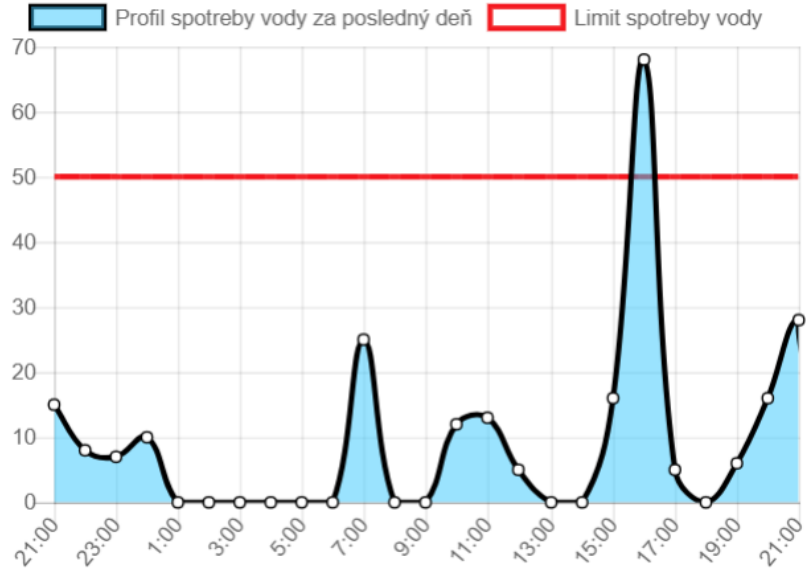
Zrušiť Uložiť





Crossing the threshold





Pozor! V čase od 23:00 do 0:00 pravdepodobne došlo k malému alebo strednému úniku vody.

Pozor! V čase od 16:00 do 17:00 pravdepodobne došlo ku veľkému úniku vody.

Conclusion

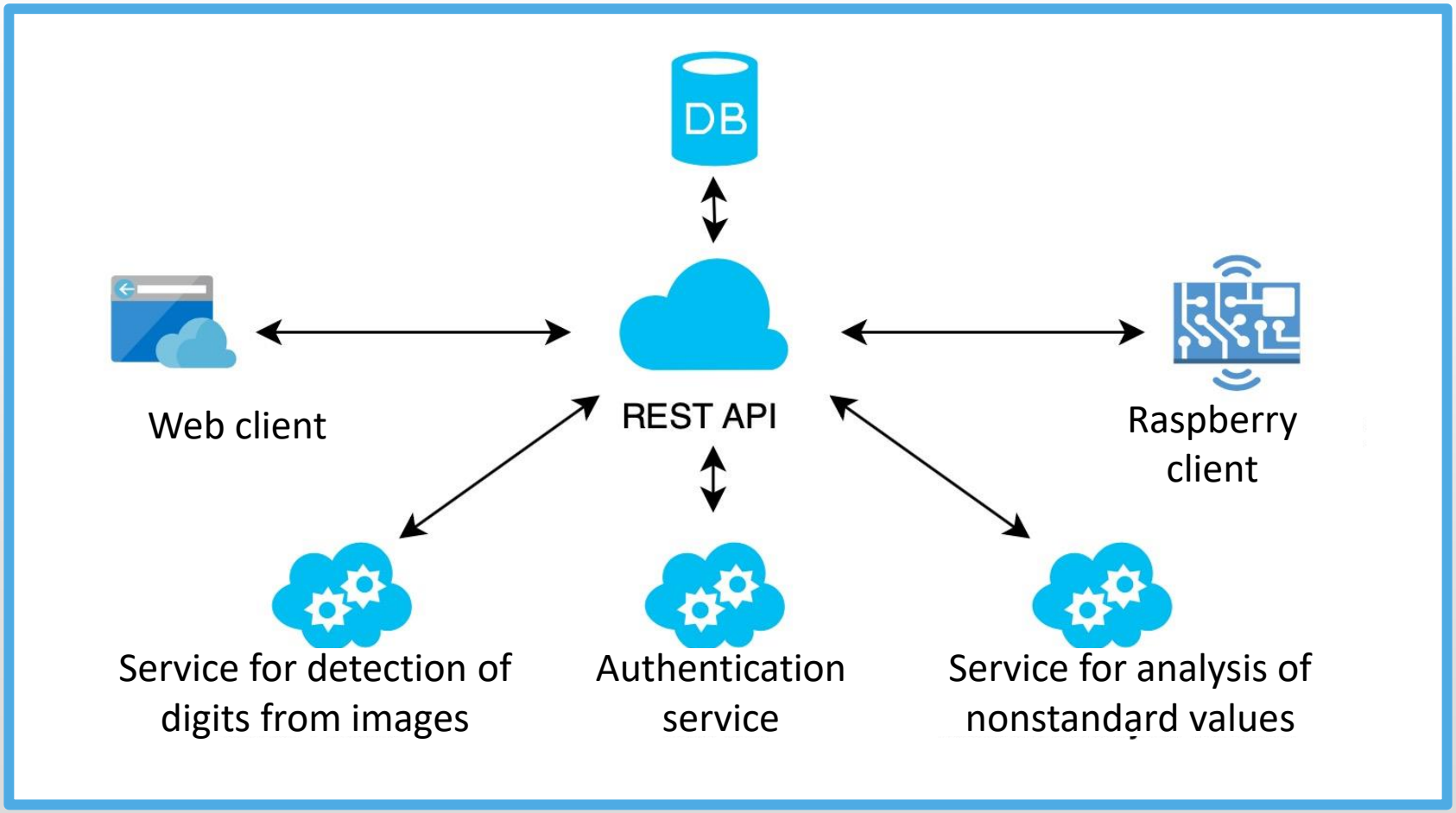
- Possibility to use in households with analog water meters
- The solution requires no intervention to metering devices or piping
- Provides real-time notification of leakage (based on threshold)
- Overview through the web solution
- Wide possibilities of expansion

EXPANSION OF THE SYSTEM

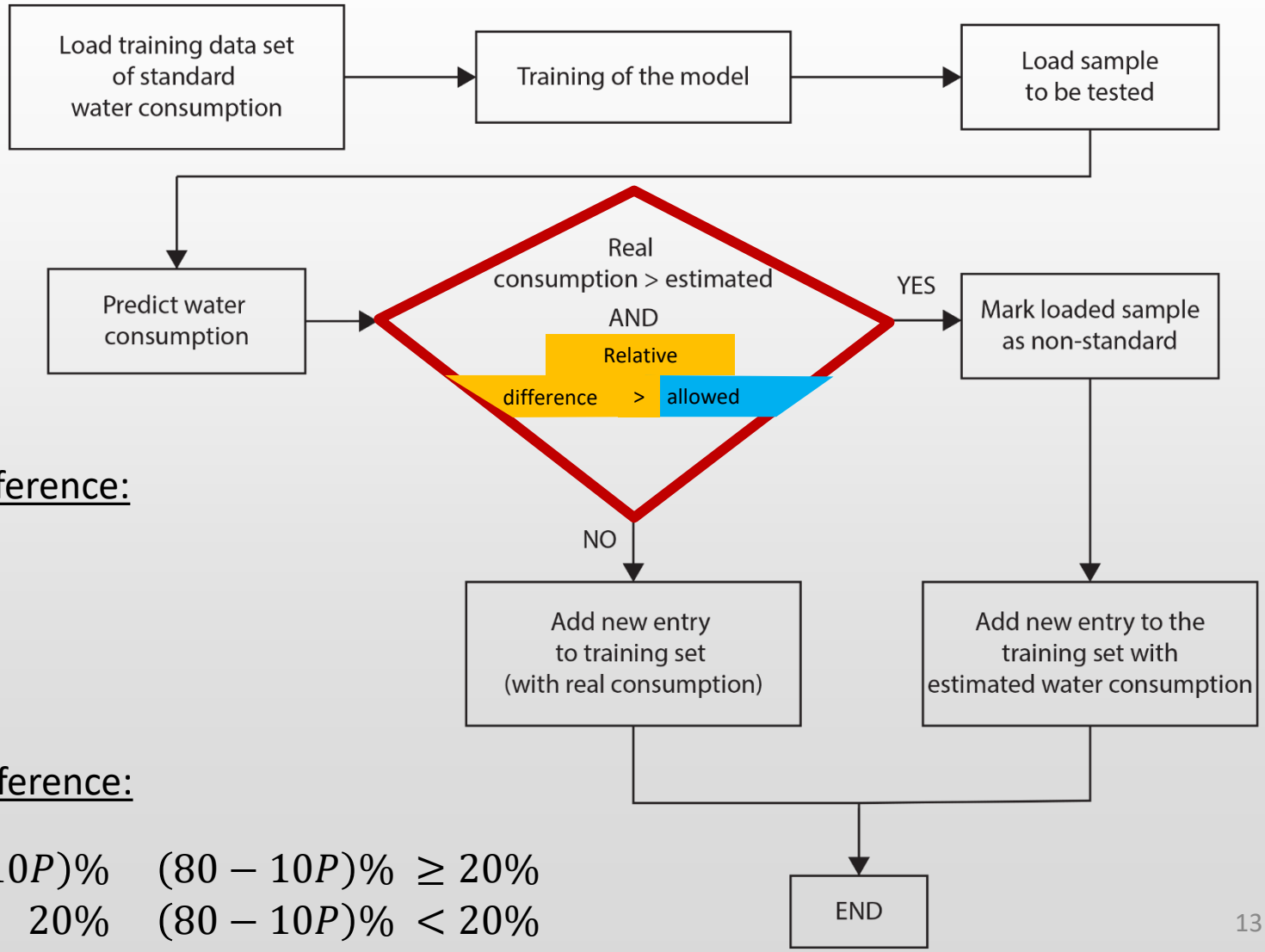
Expansions

- Separate server application from the device
- Store data in NoSQL database
- Add additional camera
- Use machine learning algorithms for detection of non-standard situations
- Introduce security

Proposed architecture



Algorithm for detection of nonstandard situation



Relative difference:

$$R_D = \frac{|a-b|}{\frac{a+b}{2}}$$

Allowed difference:

$$D = \begin{cases} (80-10P)\% & (80-10P)\% \geq 20\% \\ 20\% & (80-10P)\% < 20\% \end{cases}$$

Thank you for your attention

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