



CORNET TRUSTED-IOT

16 / 11 / 2023

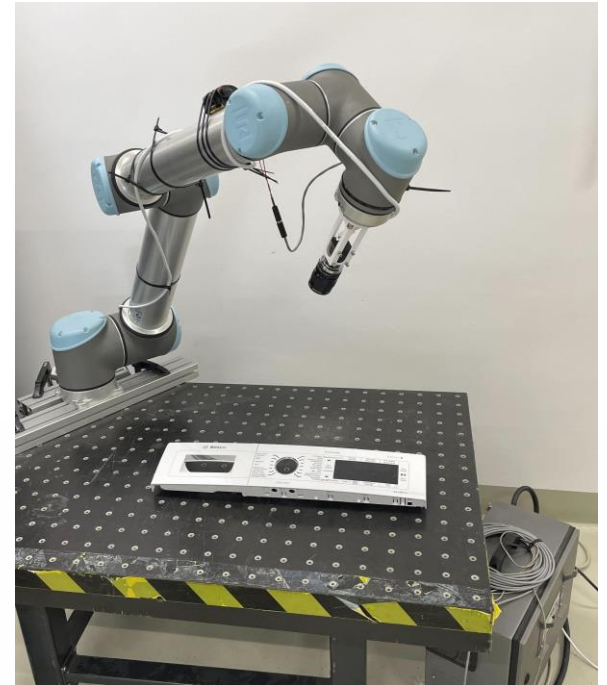
GFAI TRUSTED ROBOTICS IN THE FIELD OF QUALITY ASSURANCE

BENJAMIN DROST, IMMANUEL RETTIG

USE CASE

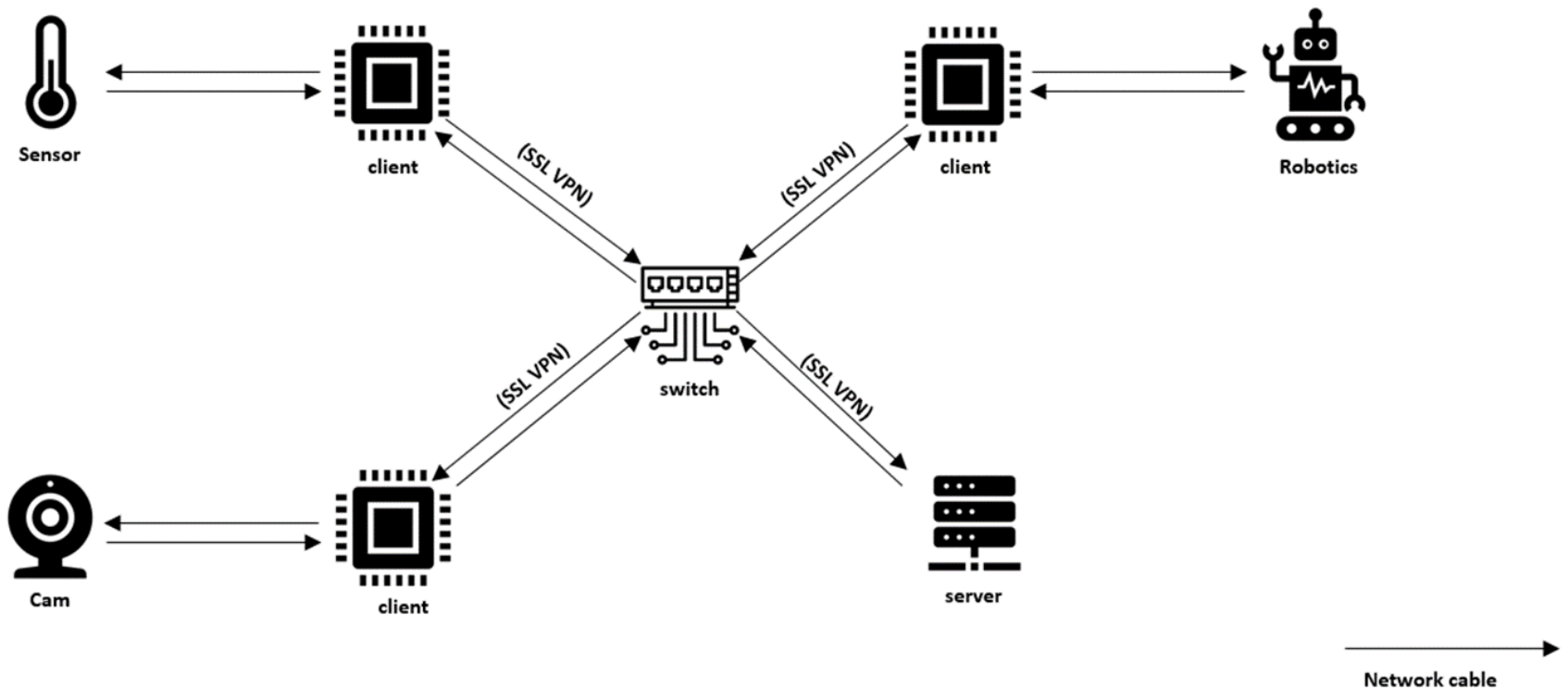
Secured quality assurance of workpieces

- Automated quality inspection
- Robot-assisted image capture
- Defect detection
- Communication of all involved devices via secure network



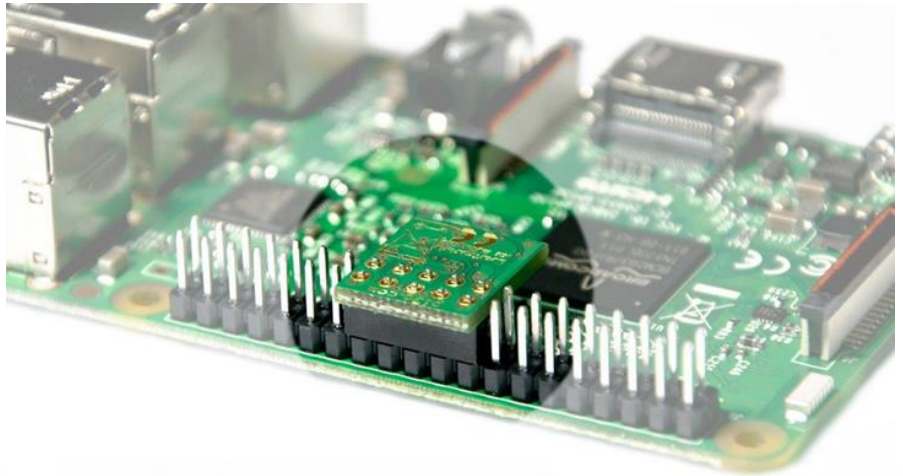
VIRTUAL PRIVATE NETWORK

Secure client-server model



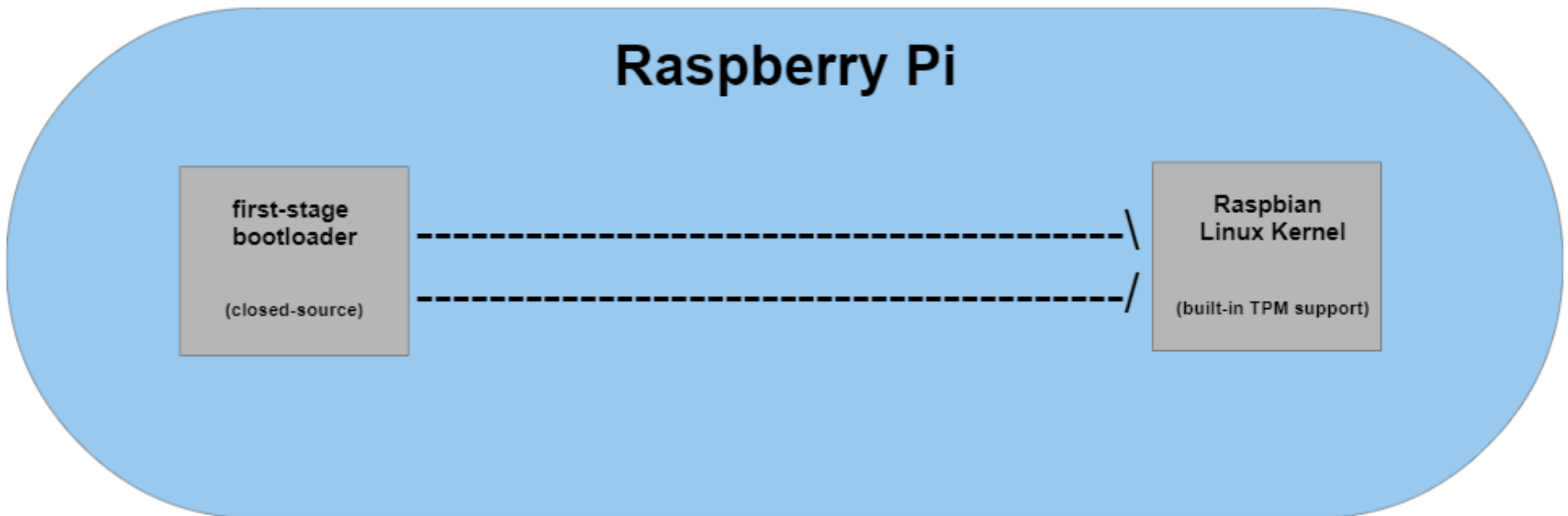
HARD- AND SOFTWARE SECURITY

- Use of Trusted Platform Modules for Raspberry PI
- Authentication through signatures, storage of crypto keys etc.
- Can be used with TPM2/TSS2 software (<https://github.com/tpm2-software/tpm2-tss>)
- SoftEther VPN



U-BOOT BOOTLOADER WITH TPM

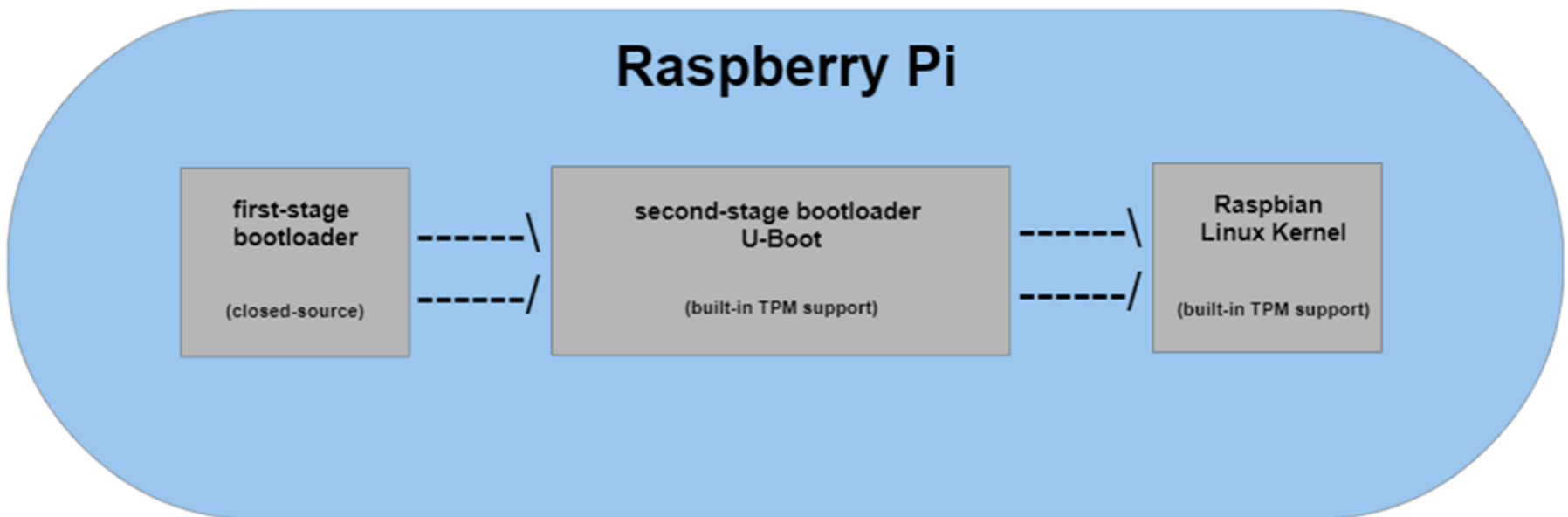
- TPM can be utilized through a second-stage bootloader prior to booting the Linux kernel
- The serial-to-USB converter allows monitoring of the Raspberry Pi's boot process



- Website: <https://github.com/joholl/rpi4-uboot-tpm>

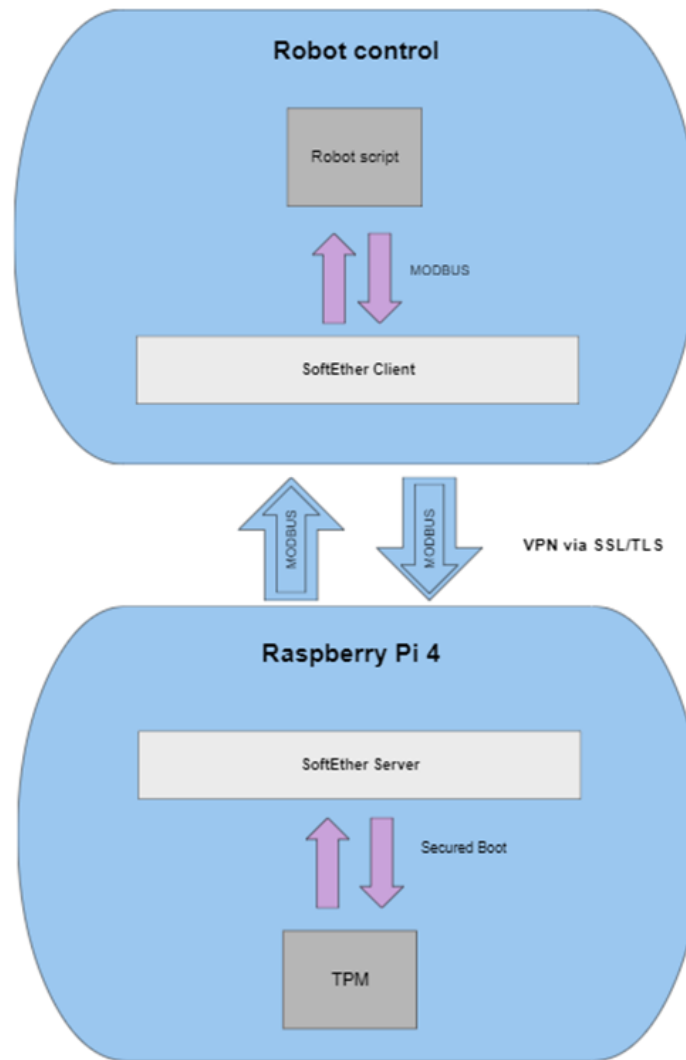
U-BOOT BOOTLOADER WITH TPM

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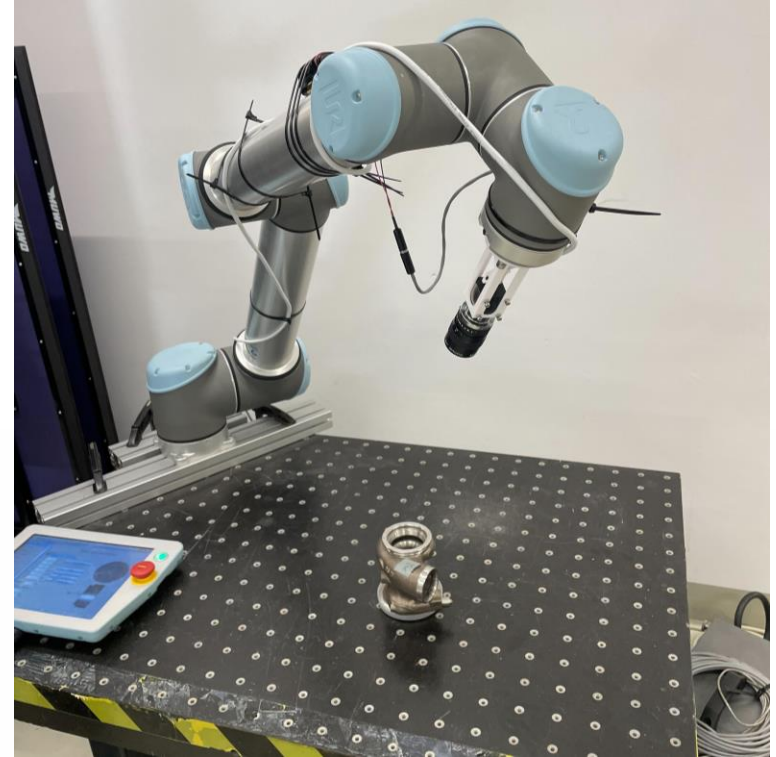
SOFTETHER



IMPLEMENTATION

Universal robot

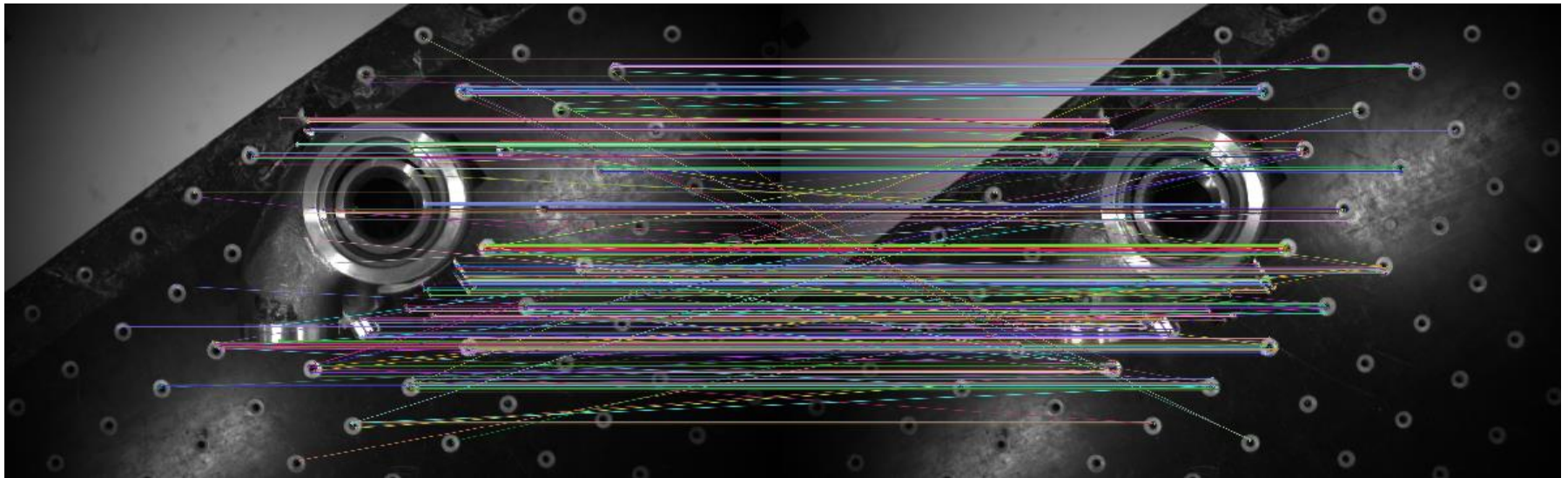
- Server communicates via modbus with the UR10 and via TCP/IP with an industrial camera to synchronize the sequence and control of the actuators



IMPLEMENTATION

Image processing – Step 1

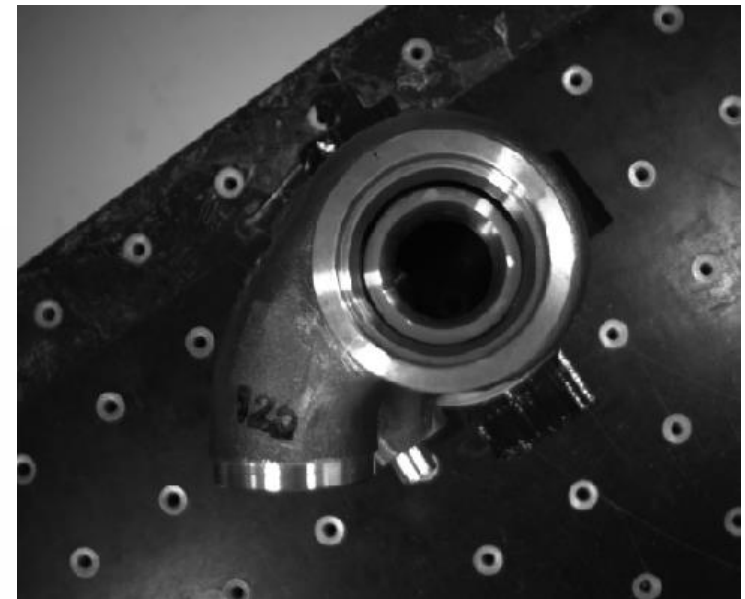
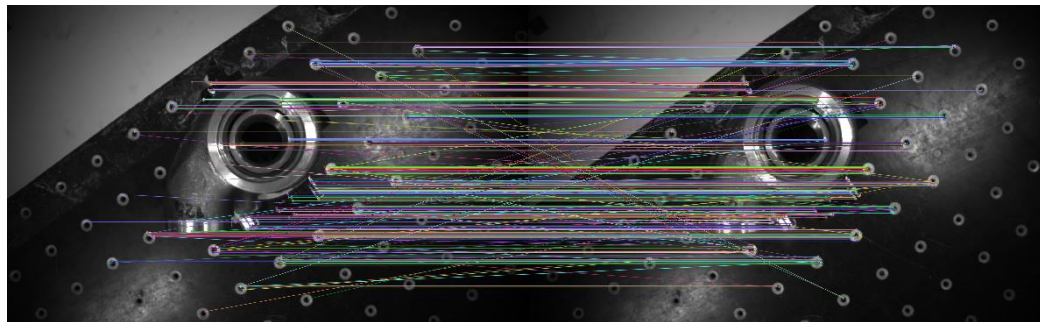
- Implementation in pyflow
- Recognize reference features in different images



IMPLEMENTATION

Image processing – Step 2

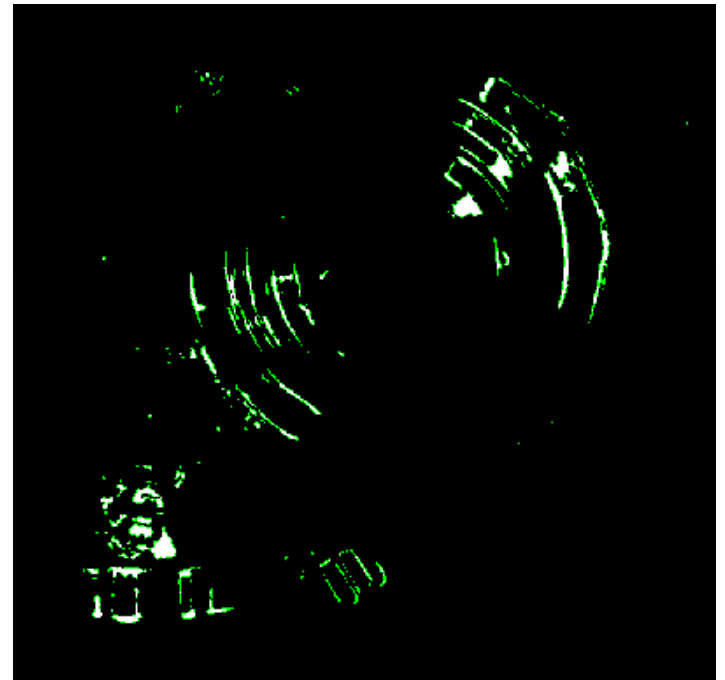
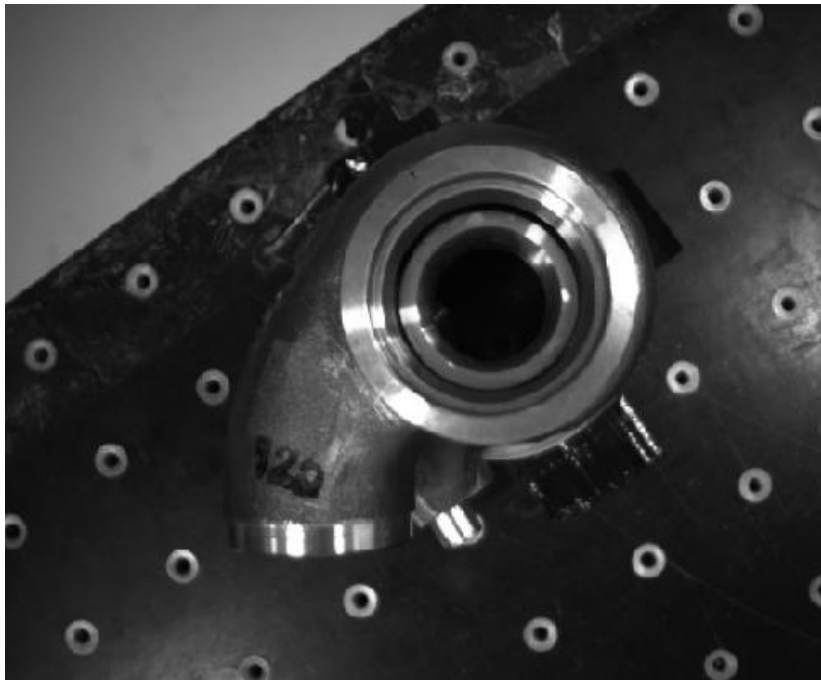
- Superimposition of images by means of the reference points



IMPLEMENTATION

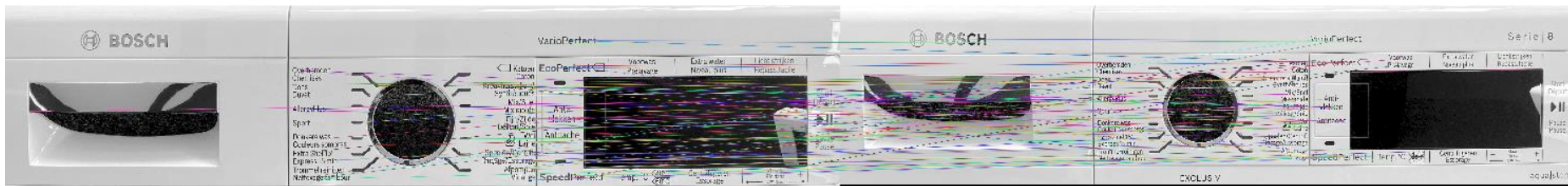
Image processing – Step 3

- Finding and marking the defect locations on the basis of the reference image

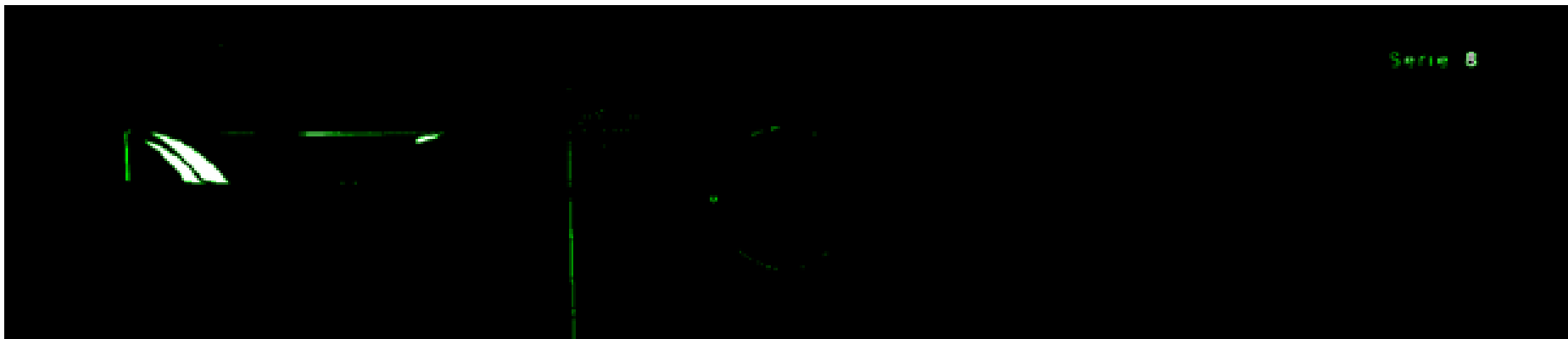


WASHING MACHINE PANELS

Image processing – Step 3



Matching keypoints between two panels



Difference between reference and test image

TRUSTED ROBOTICS IN THE FIELD OF QUALITY ASSURANCE

Thank you
for your
attention

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