UNIVERSITÀ di VERONA
Dipartimento di INFORMATICA

ICE Lab
INDUSTRIAL COMPUTER ENGINEERING

Pervasive monitoring through wearable devices in industrial context

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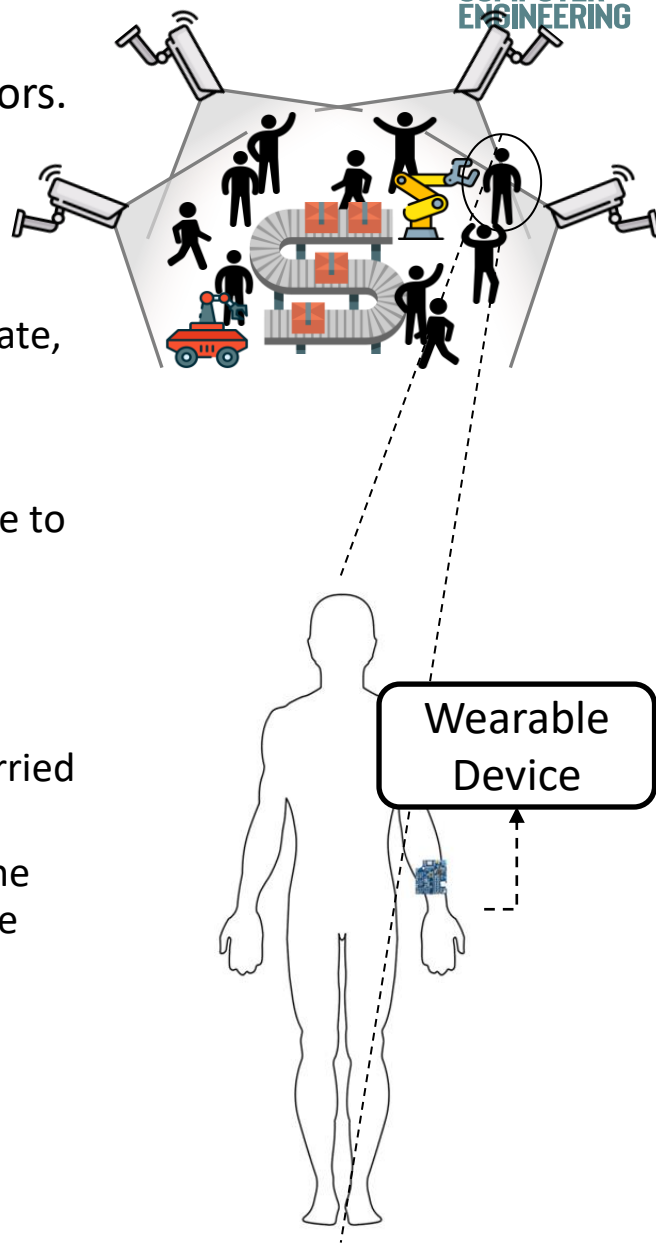
Roadmap

- **Capabilities:** Collect motion and physiological data through inertial and physiological sensors.
  - **Recognize users' activities:** walking, standing, running, falling, steps.
  - **Recognize motion information:** acceleration, angular velocity, magnetic field, direction.
  - **Recognize specific gestures:** shake, applause, control gestures, etc.
  - **Recognize physiological parameters:** blood pressure, body temperature, breathing rate, heart rate, blood oxygen saturation, and various electrophysiological signals.
- **Goal:** Reduce the impact of limitations in video-based monitoring systems.
  - **Identification:** Workers' identification through video base systems presents many limitations due to legal or accuracy constraints.
  - **Coverage:** pervasive industrial environment monitoring is costly and not always possible.
- **Proposed solution:**
  - Equip workers with a wearable device in order to monitor their motor status and the activity carried out even within plant areas not monitored by the video system.
  - The wearable device worn by the human subject enables his/her identity recognition through the simultaneous detection of the specific pose (captured by the BeFine cameras) and of the gesture recognition captured through the wearable device.



Wearable utilization into the ICE lab

Nordic Thingy 52 Prototyping device

L: 55 mm
W: 55 mm
H: 15 mm
Cost: 36 $
Thingy 52

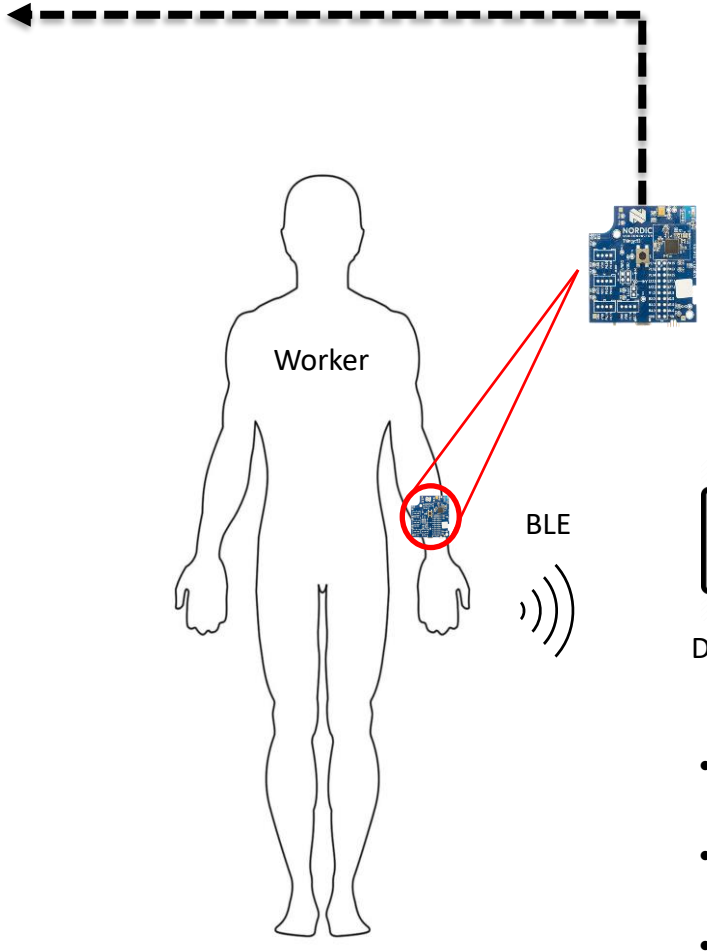
Inertial sensors
- Accelerometer
- Gyroscope
- Compass
- 1Hz - 200 Hz

Edge computed
- Quaternion
- Pitch, Roll, Yaw
- Rotation Matrix

Environment sensors
- Temperature,
- Humidity
- CO_2 level

Communication technology
- Bluetooth Low Energy (BLE)

Battery 1440 mAh



NVIDIA JETSON XAVIER NX:
Low Power: ~10 W
Low Cost: ~300 $
RGB-D camera

Data collector node

kafka

- Action Range
  - 50 meters
- Connected Devices
  - 5 for each Jetson
- Battery duration of each node
  - 4 days at 200 Hz

Integrated with various ICE Lab applications

Dataflow

Wearable

It will be replaced by a special wearable for the ICE laboratory.

NVIDIA JETSON XAVIER NX

MQTT

Standard industrial network protocol on shared communication channel

kafka

Data fusion over Kafka

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Thanks for the attention

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For more details let's meet at live demo…

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