

# Ultra-Wide Band (UWB) real time positioning aided by IMU

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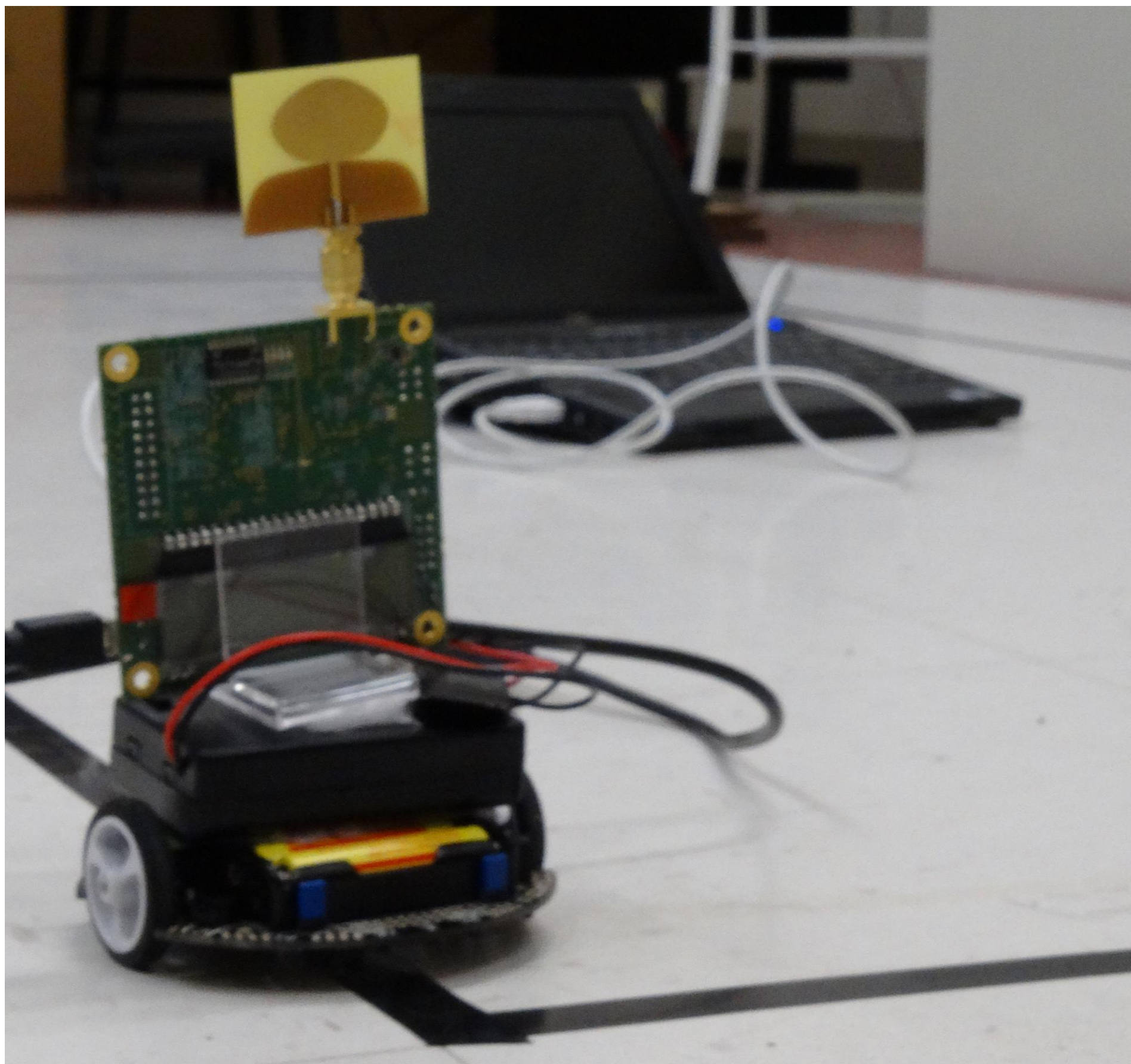
## Motivation:

- Growth of applications depending on indoor precise positioning.
- Wireless technologies other than UWB can't provide inexpensive, low power, precise (order of decimeters) positioning.
- UWB positioning systems have reduced accuracy in NLOS conditions.

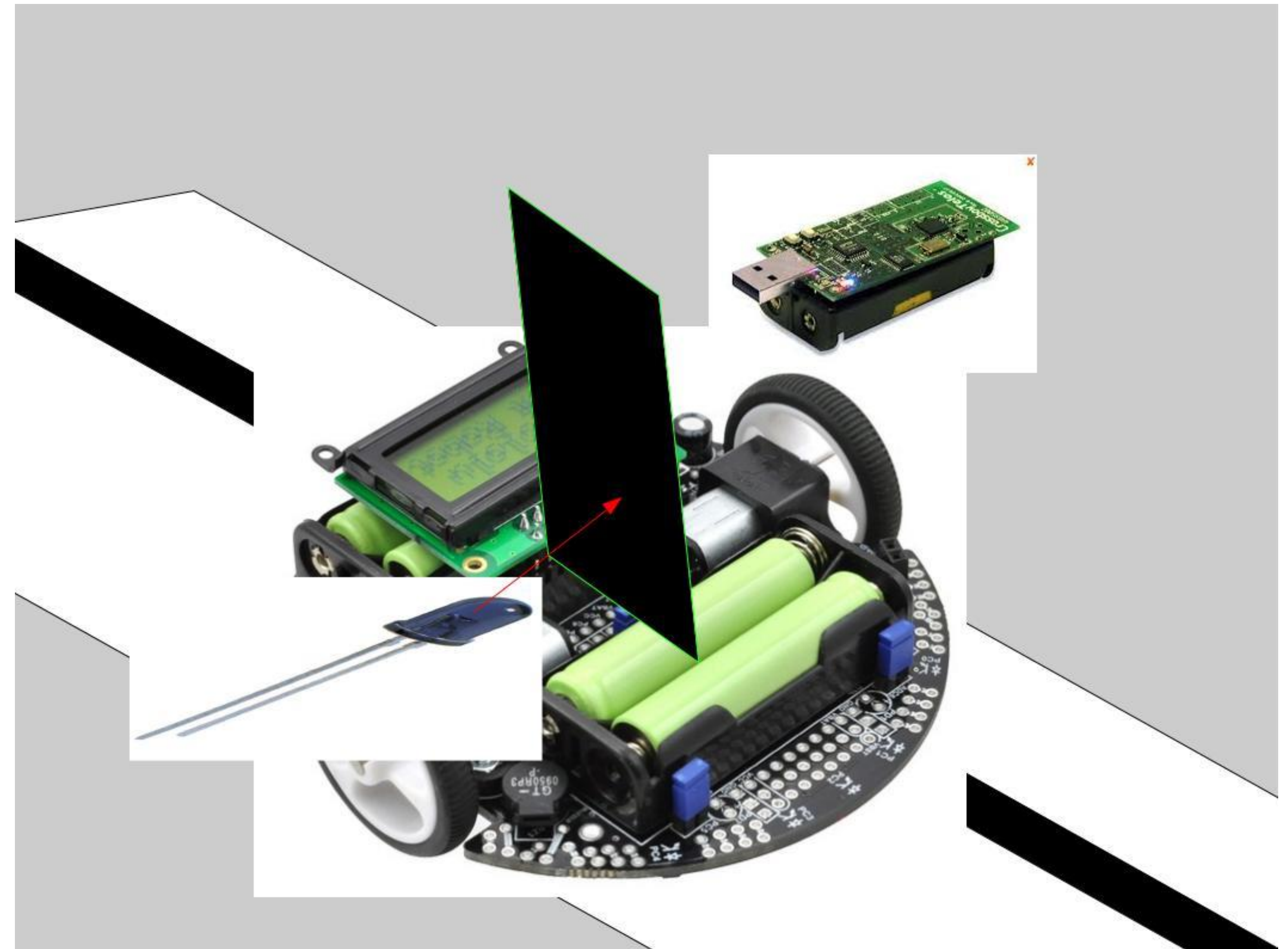
## Technology to be used

IMU Digital Combo  
Board - 6 Degrees of  
Freedom  
Gyroscope : ITG3200  
Accelerometer :  
ADXL345  
(from www.sparkfun.com)

Decawave EVK100 evaluation  
kit.  
Accuracy in LOS : 10 cm  
IEEE 802.15.4-2011 compliant  
Range : up to 290 m  
Dimension : 7 cm by 7 cm  
Communication rate : 6.8 Mb/s



## Real-time evaluation system



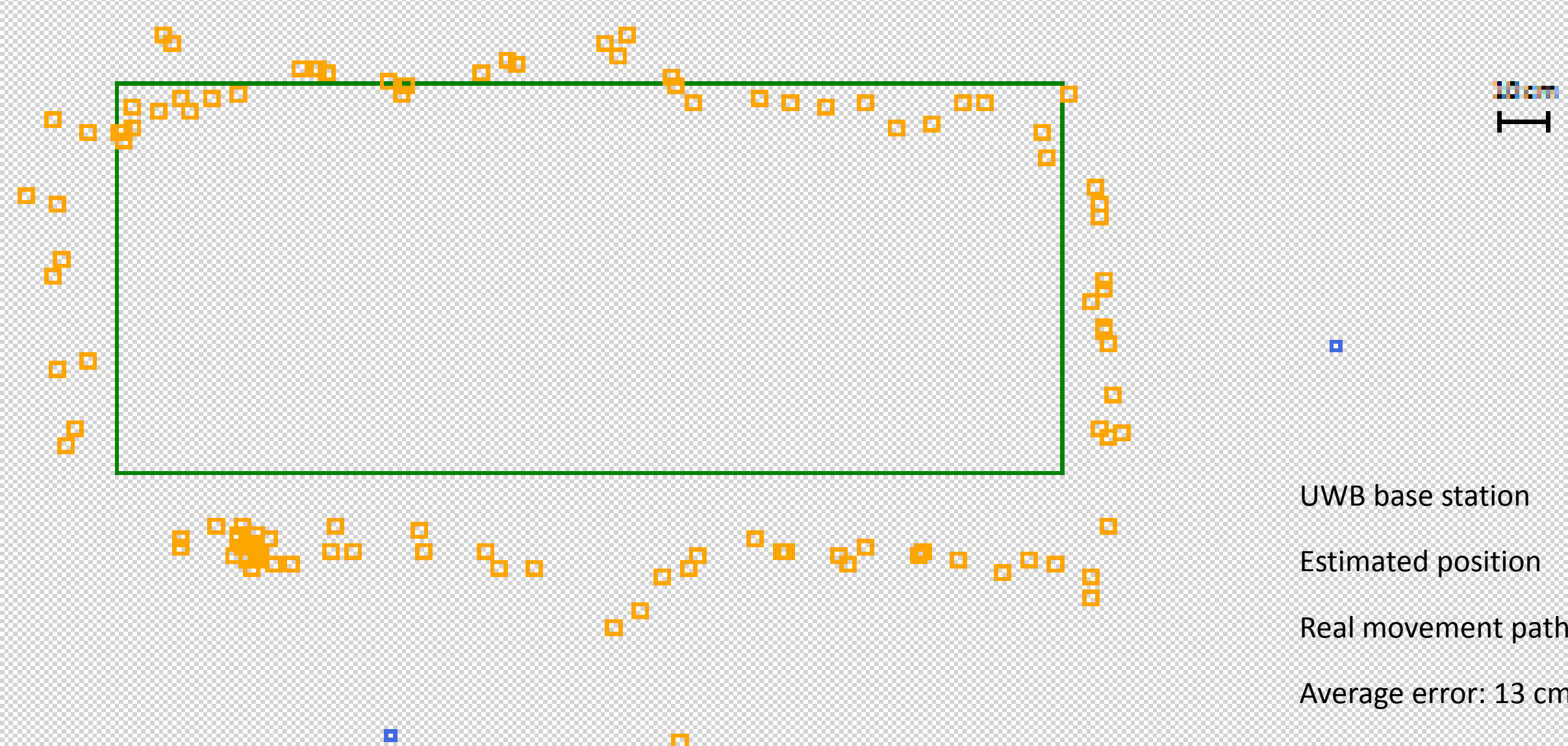
Routes are composed of some straight line segments with horizontal infrared LED-sensor pairs placed at known locations near the beginning and end of the segments. The Pololu 3pi line-following robot which carries the moving UWB node, blocks infrared signal and we can discern the true position of the moving node.

## Objectives

1. What is the accuracy of Decawave UWB positioning in LOS/NLOS condition?
2. Is it possible to have a communication channel simultaneous with positioning? If yes, what is the maximum communication rate?
3. How much can the NLOS error be mitigated by methods proposed in literature?
4. How much can the IMU system and Kalman filter increase the LOS/NLOS accuracy of the UWB systems?

## UWB positioning results

### Maximum Likelihood algorithm + Kalman Filter



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