MOBILE ROBOTS Case Studies 7

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Session ID: 680259

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Complete state

Consider a robotic application in a forest, where a robot need to move in hard all-terrain conditions. What should be included in the state of the robot, to be complete in the context of simple displacement? (several answers possible)

A. Robot 3D pose
B. Weather conditions
C. Date and hour
D. Start and goal position
E. Battery level

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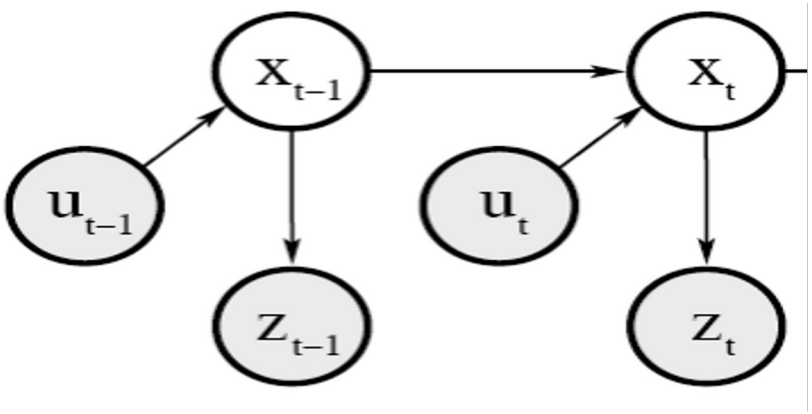
Complete state



What should be in x_{t-1} to predict x_t ?

A. Robot 3D pose
B. Weather conditions
C. Date and hour
D. Start and goal position
E. Battery level

Robot localisation using particle filter

You have to deal with a robot where localisation is based on a particle filter. The robot moves by rotations (angle *ß* [deg]) followed by straight movements (distance *d* [m]). In the software of the particle filter, the sampling of the control action in polar coodinates (r[m],α[deg]) is:

$r_{n+1} = r_n + d + d*\text{rand}()*0.02$ $\alpha_{n+1} = \alpha_n + ß + \text{rand}()*2$

The function rand() gives a random number between +1 and -1.

What sensors for motion perception are probably available on this robot?

A. Incremental encoders on the wheel
B. Motor speed sensor
C. IMU+ (Accelerometer + gyroscope + magnetometer)

Robot localisation using particle filter

$$r_{n+1} = r_n + d + d*rand()*0.02$$
$$\alpha_{n+1} = \alpha_n + \beta + rand()*2$$

A. **Incremental encoders on the wheel**
B. **Motor speed sensor**
C. **IMU+ (Accelerometer + gyroscope + magnetometer)**

Scan without proprioceptive sensors

You have to implement a localisation algorithm for a hand-scanner, that has no other sensors than the scanner and is controlled manually by an operator.
When thinking about a Bayes filter for this application, which statement is correct?

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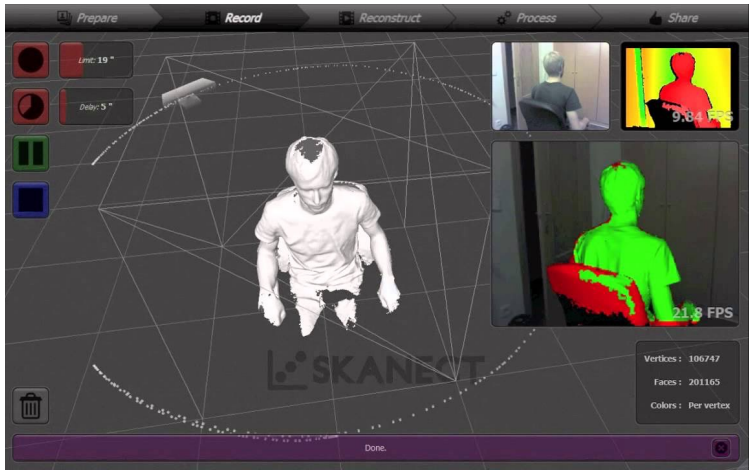

A. **Having no possible control model, one cannot use a Bayes filter**
B. **Here a grid-based Baysian filter is applicable and better than a Monte Carlo (particle filter) localisation**
C. **A Bayes filter can work if the properties of scanning operation is known and if the sensor provides sufficient (rich) information**

Scan without proprioceptive sensors

Even if we do not have a precise information on the control action (made by the human) we can have an approximation. If this approximation is very vague but the correction can rely on very good sensors, this can work.

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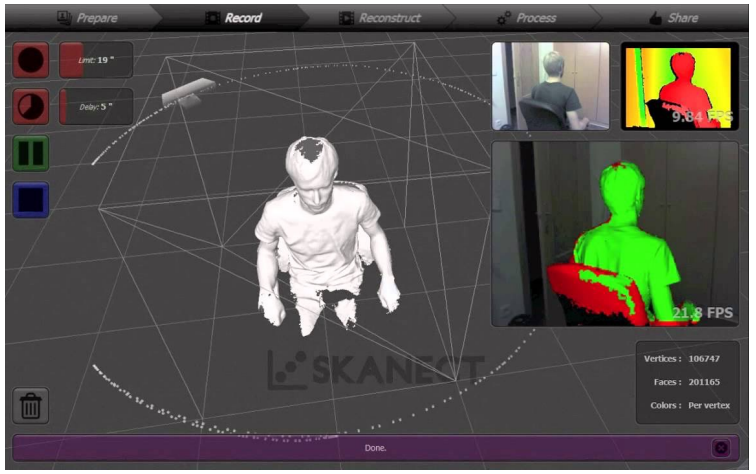

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