

heig-vd

Haute Ecole d'Ingénierie et de Gestion
du Canton de Vaud

RH1-Y

Open Challenge

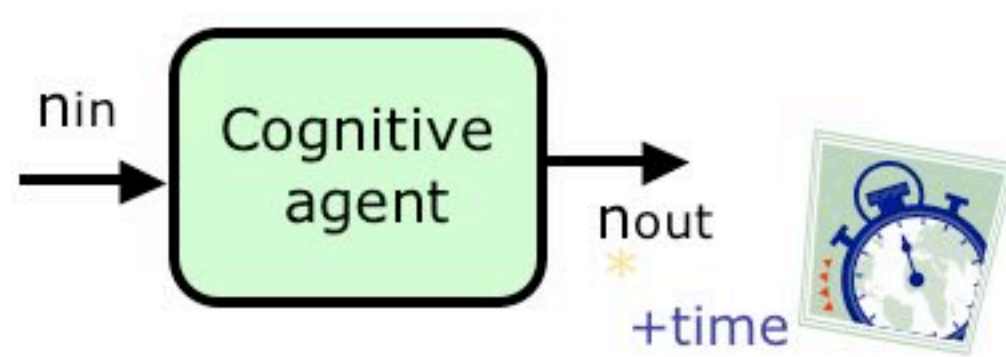
- Cognitics framework
- Vocal dialogue
- Agile strategic programming
- Interactive guidance

Conceptual improvements

- Integrate past successful approaches
 - Trajectory management, navigation paradigms
- O3NEIDA approach (IEC 61'499)
- Robust holonomic basis
- 3D TOF distance vision

Cognitics framework

- Cognitics is a domain which encompasses the science and techniques of automated cognition
- The MCS framework provides definitions and metrics for the quantitative assessment of cognitive entities



- Expertise :

$$E = K / \Delta t \text{ [lin/s]}$$

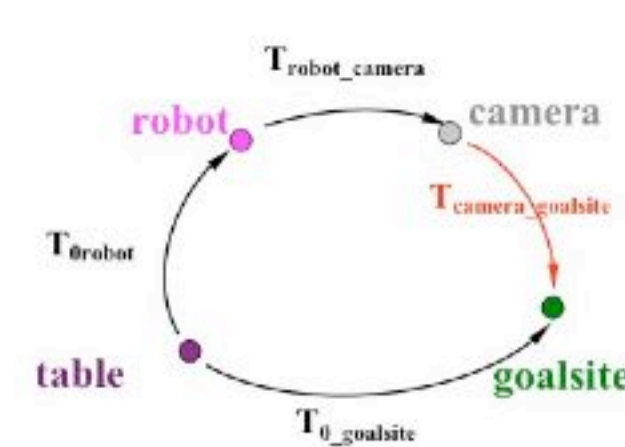
« does it (right and) fast »

Some consequences:

- Work in small contexts
- Use goal-oriented models
- Systematically assess the quantities of cognitive entities and requirements
- Beware of asymmetry in input-output constraints
- Notice the importance of access operators

Agile strategic programming

- Multiagents
- 100 ns granularity
- VAL-type instructions
- Piaget environment
- Distributed control

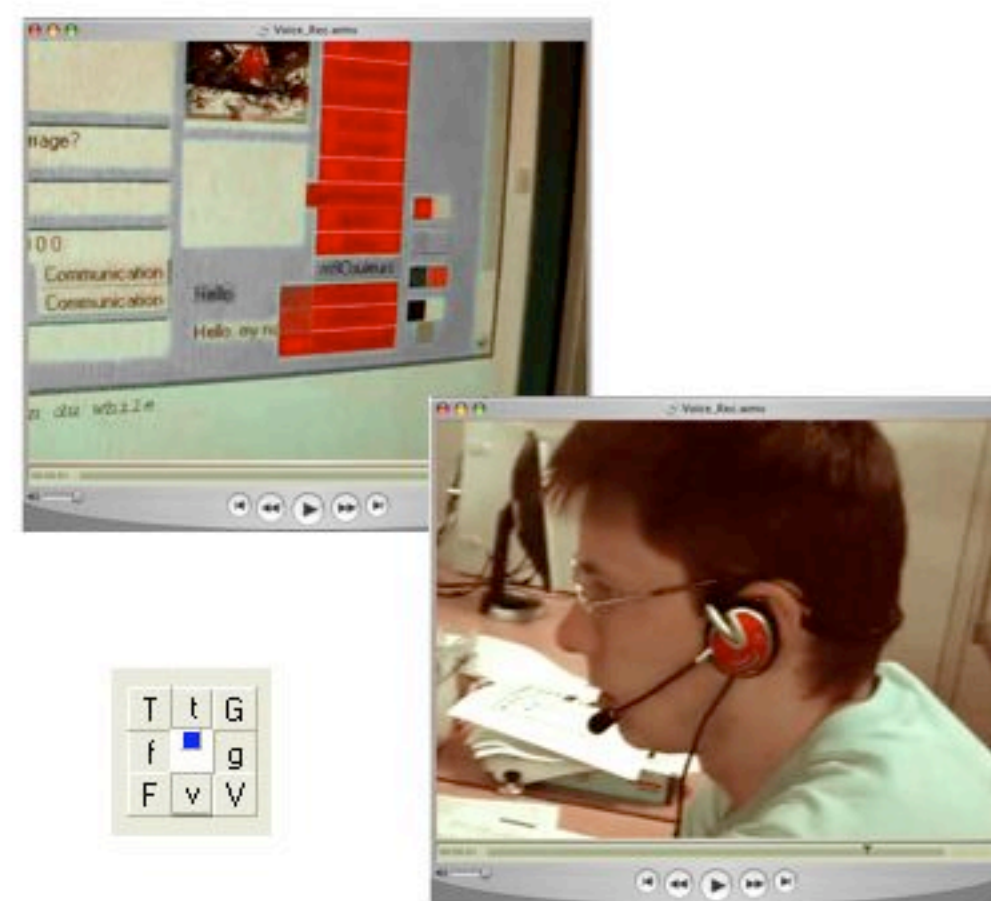


```

.....
11: SleepAGN(0.05);                               break; case
12: if(!SignalIn(NSISStart))                       break; case
    GoState(6);
    else
    GoState(20);                                     break; case
20: DemarrerMatchAGN();                             // start 90 s timer etc.
    break; case
21: SignalOutAGN(NSOAspirateur, true);             // start motor vacuum
    break; case
22: SignalOutAGN(NSORouleauIN, true);              // start motor brush
    break; case
23: ApproAGN(HoleNb1, 15);                          break; case
24: MoveAGN(HoleNb1);                               break; case
25: MoveAGN(Trans(173,90,-90));                     break; case
26: ObserverLigneAGN(NL, NCStart, NCStop)          // Visual analysis of a row
    if (N2Jaune>0) // totems are yellow; balls are white
        [PositionTotemOuBalle[1].TypePosition=Totem;
        nbTotem = nbTotem+1;]
    else
        PositionTotemOuBalle[1].TypePosition=Balle;
    break; case
27: ...
    
```

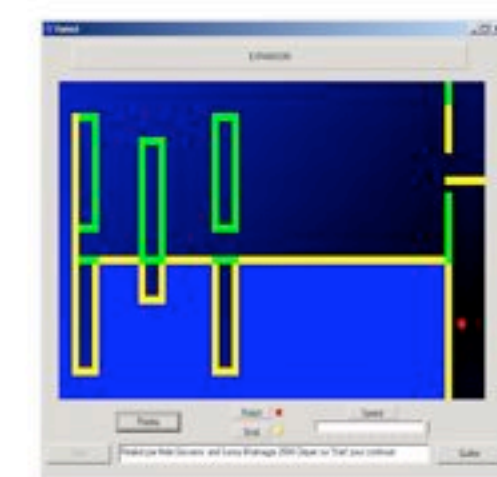
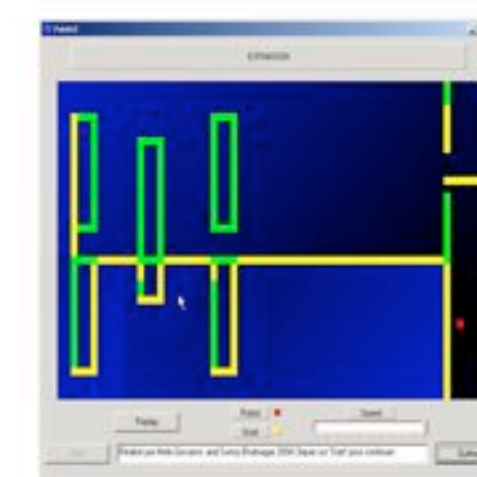
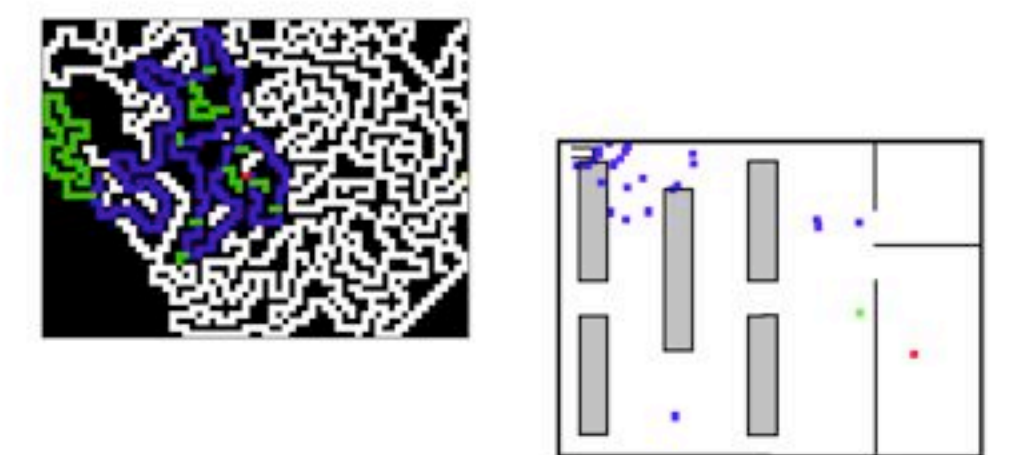
Vocal dialogue

- Ten word recognition
- "Unlimited" speech synthesis
- 3 complementary agents
 - Word processing agent
 - Dialogue manager
 - Strategy enforcement agent
- Interactive guidance possible
- Beware of difficulties in normalisation of signal intensity and speaker specifics



Navigation paradigms

- Deterministic
- Probabilistic
- Learning with modelling



Trajectory management



Trajectories are typically defined as follows:

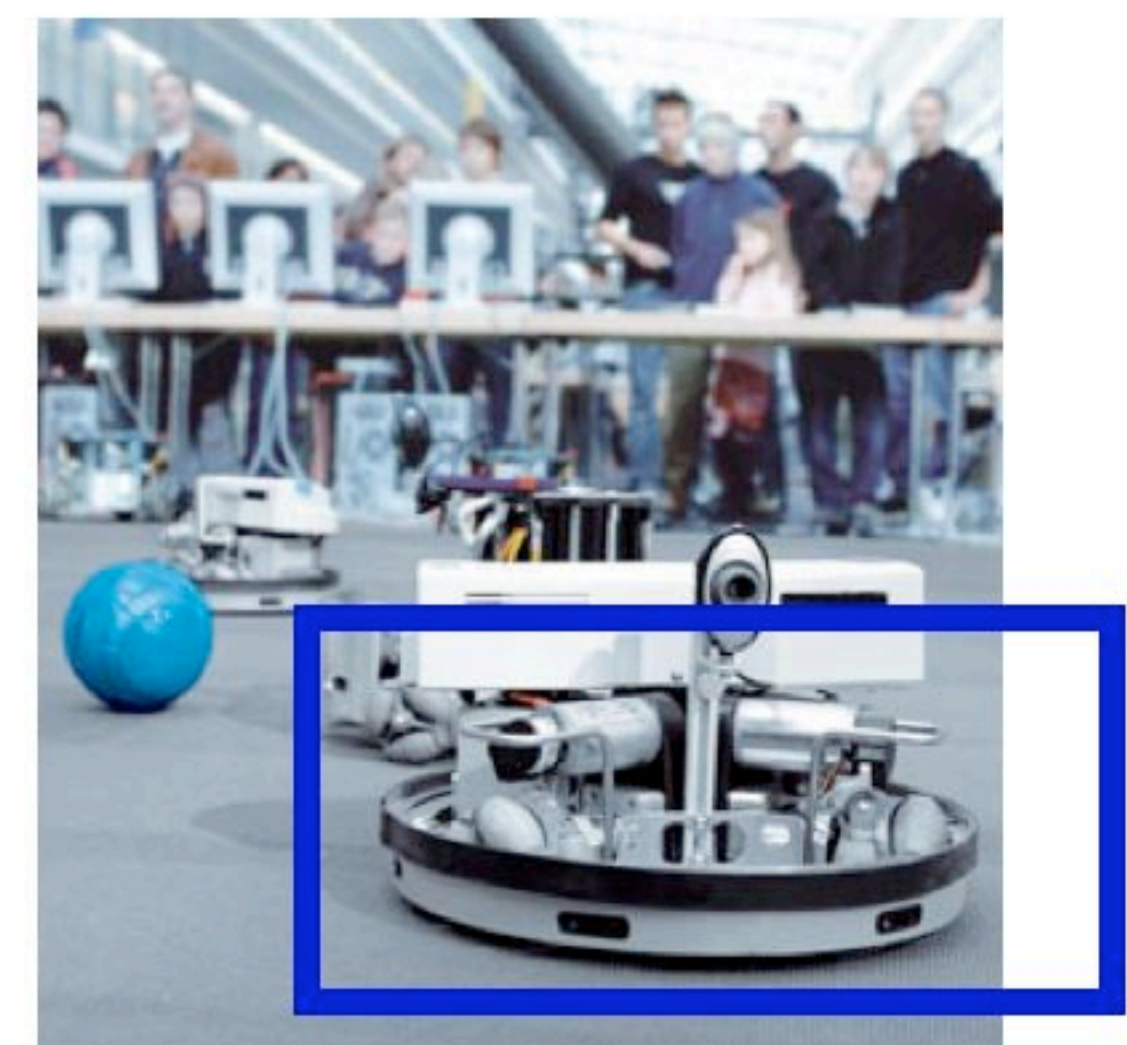
- Select key points (x,y) on a map,
- Interconnect them with linear sections
- Resample the trajectory at regularly-spaced intervals
- Smooth the trajectory, iteratively until some vehicle-related, maximum curvature constraint is met ([reference for curvilinear smoothing](#))
- Define local orientation (tangent angle) for each sample (x, y, theta)

Trajectories are typically tracked as follows:

- Match vehicle position and orientation in terms of main structure
- Define relative position and orientation (transformation) of each wheel or limb (thereby superposing gait)
- Interpolation is made directly at individual wheel or limb level between so-defined successive positions along trajectory



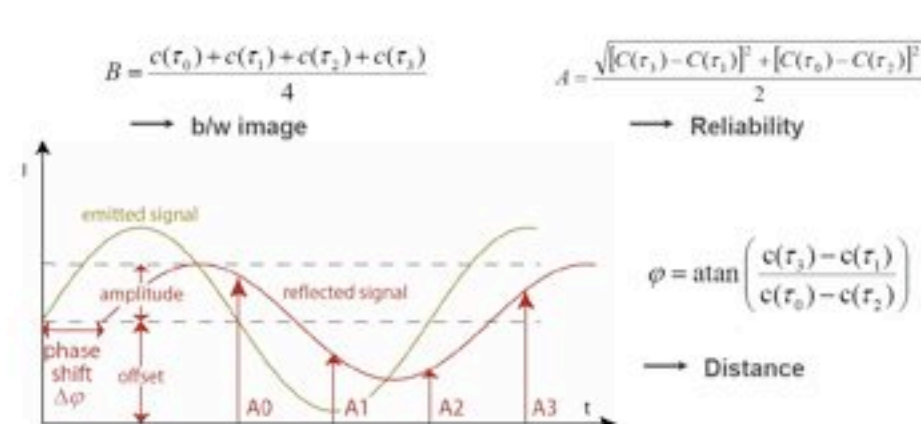
Robust holonomic basis



Doc. FESTO

3D TOF distance vision

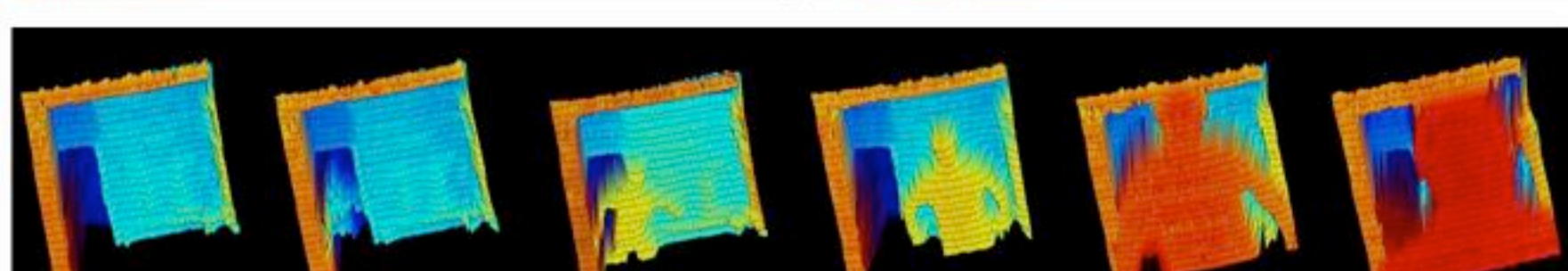
Phase-Measurement TOF Principle - Theory
the 4-Tap Algorithm



SwissRanger 3000 Camera Characteristics

- Size
 - 50mm x 48mm x 67mm
- Weight
 - 175g
- Power Supply
 - 12 V @ 1 A max
- Interface: Default USB2.0
 - Read & Write registers
- OCIF sensor resolution (176x144)
- Background suppression
- Distance resolution: see Demo

csem



More information

- More information on ARY and RH1-Y robots: descriptions and examples, pictures and videos; <http://ary1.populus.ch>, <http://rahe.populus.ch>
- iAi : Industrial Automation Institute("Institut d'Automatisation Industrielle »). Our team belongs to the LaRA (Laboratoire de Robotique et Automatisation) which is one section of the institute; <http://iai.heig-vd.ch>
- Robocup@Home : THE useful link, if you want to know more about this new league. The website is relevant about everything you need to know; www.robocupathome.org
- RoboCup2006: this one is dedicated to the "classic" RoboCup competition. The both of them (RoboCup & @Home) will take place at Bremen, in Germany, in June 2006. www.robocup.org
- (Swiss)Eurobot : a little bit off topic, but this competition is cool too. Each year some of our students participate to the challenge; www.robot-ch.org
- LaRA.populus.ch : includes references and publications of our lab.