DOMEO Project
AAL-2008-1-159

Description of robuMATE

Document Information	
Title	Description of robuMATE
Workpackage/Deliverable	WP4
Responsible	ROBO
Due Date	
Actual Date	25/08/2011
Type	Delivrable
Status	Version 1.0
Dissemination Level	Public
Authors	Arnaud LAGO \ Meftah Ghrissi
Project URL	www.aal-domeo.eu

Abstract:

This document is accompanying the delivery of robuMATE prototypes, also called Kompaï (trademark for further commercial deployment).

Keyword List:
robuMATE, description, fact sheets

Summary

There are 5 robuMATEs/Kompaï delivered to partners:
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Robot serial number	Date of delivery	Location
1-5-5979-4	01/03/2010	Bidart, France
1-1-5979-1	02/06/2010	Budapest, Hungary
1-2-5979-2	02/06/2010	Vienna, Austria
1-17-10-2	11/10/2010	Paris, France
1-3-5979-3	01/11/2010	Toulouse, France
1-27-5979 -5	20/05/2011	Budapest, Hungary

Except the last one delivered later, all robots have been upgraded at mid-term to implement improvements coming from preliminary lab and on site trials.

Table of Content

1. Introduction

The robuMATE/Kompaï is an indoor mobile platform with 2 propulsive wheels used as a generic platform and designed to ease the development of advanced robotics solutions. It can recognize and synthesize the voice, and navigate in unknown environments. It also remembers meetings, manages your shopping lists, plays music and can be used as a video conference system.
It is equipped with an embedded controller running Windows CE for low level control, and with a tablet-PC running Windows Embedded Standard 7 for high level applications.

In this project it is used as a personal assistant for elderly persons, as tele-presence device and doubt removing.

Figure 1: robuMATE/Kompaï

2. Technical characteristics

|	
Platform	robuMATE/Kompaï
Dimensions	L x l x h = 455 x 41 x 125 mm
Ground clearance	50 mm
Weight	31 kg
Number of wheel	2 propulsive wheels, 2 castor wheels
Direction	Differential type
Turning radius	Turn on the spot (middle point of propulsive wheels) needs an area diameter of 552 mm.
Max speed	1 m/s
Playload	Max 30 kg
Slope	Evolution on a flat surface, max slope to 11% without payload
Using temperature	0°C-40°C
Storing temperature	0°C-60°C
Humidity	0-90% without condensing
Batteries	Li-ion 24 VDC – 20 Ah
Autonomy	About 8 h
Recharging time	About 6 – 7 h
Embedded controller	PURE for low level and robuBOX-Kompaï for high level.
Operating system	Windows CE 6.0 for embedded computer and Windows Embedded Standard 7 for tablet PC.
Driving mode	Xbox 360 wireless gamepad, automatic navigation.
Sensors	Sick laser Axis IP camera USB camera 9 US sensors 16 IR Sensors 2 bumpers
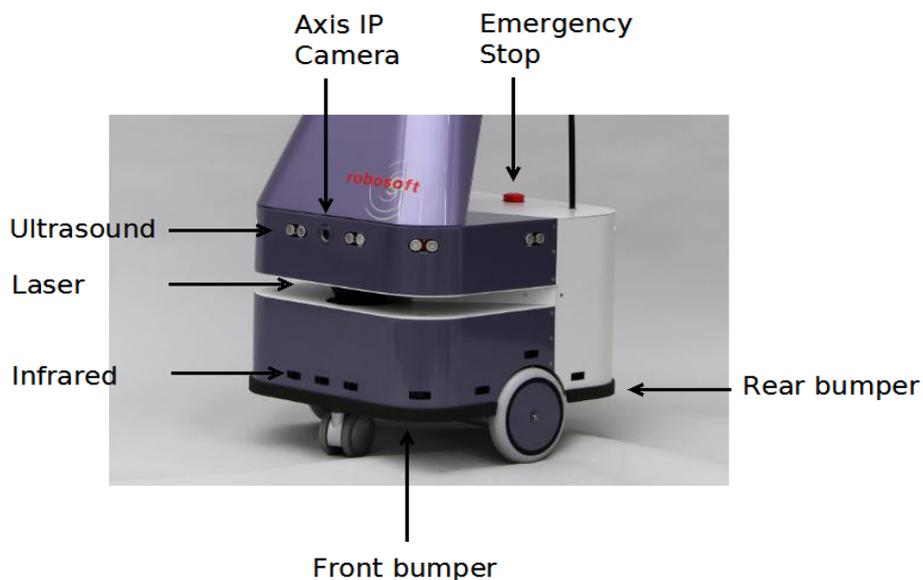
Figure 2: robuMATE/Kompaï base
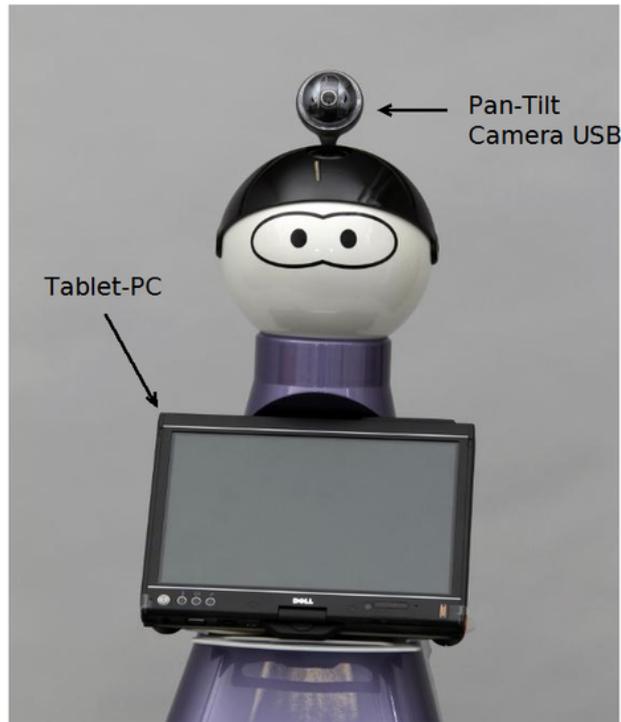
Figure 3: robuMATE/Kompaï body

3. Docking station

The robot is provided with its docking station to charge batteries. This device must be connected to the 220V. The robot can reach it automatically when its battery level is low.

Figure 4: robuMATE/Kompaï with docking station

4. Using the robot

The robot can be used by two kinds of people.

- The persons who must be assisted, in this case they will use the voice or tactile control of the HMI on tablet PC.
- The operators for tele-presence and doubt relevant that uses a web interface called Lokarria.

4.1. Robot used by assisted persons

Assisted persons have access to a graphic interface to control the robot. The main menu gives access to informative data, speech interaction control and functionalities.

Figure 5: Main menu

4.1.1. Informative data

Battery level: the battery indicator is green for full charge and turns to red when the batteries become empty. Remaining percentage is also displayed next to a little icon which turns green when the robot is charging.

Figure 6: battery level indicator

Internet connectivity: this icon indicates if the application is currently connected (green) or not (red). It automatically switch between states, some main buttons will also be disabled if the connection is lost.

Figure 7: internet connectivity indicator

4.1.2. Speech interaction control

Two buttons located on the left side are related to speech interaction. They are also displayed on every graphic page. They are **strictly independent** and are used to represent current voice recognition / synthesis states (enabled, disabled, available or not) and to switch manually turn them on and off. Here there are 3 different configurations:
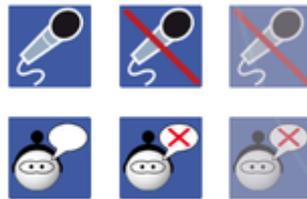

Figure 8: speech interaction configurations

In the first one both recognition and synthesis are available and enabled, in the second one they are both available but not enabled and in the last one they are both not available.

4.1.3. Functionalities

robuMATE/Kompaï robots provide 9 simple functionalities to help people into the daily life. This chapter describes these functionalities (from left to right and up to down icons of main menu, see Figure 5).

4.1.3.1. Mail
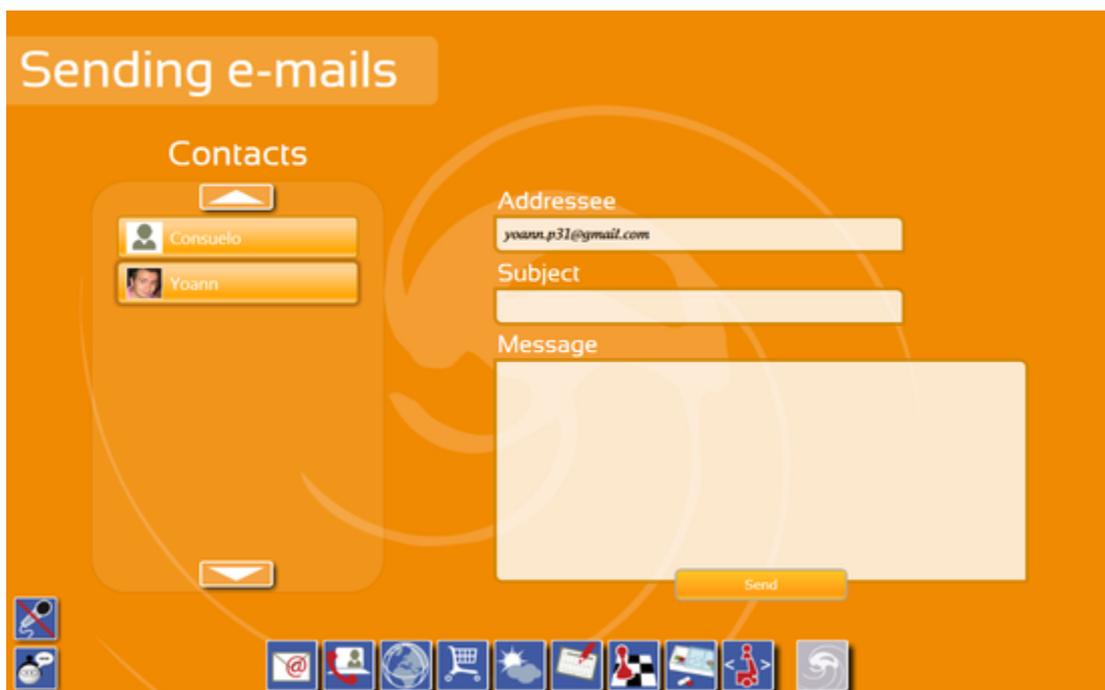
Figure 9: mail page

On the left side, the user can select one of his Gmail contact or he can use a virtual keyboard to write directly an email address. This virtual keyboard appears when one of the three areas is selected (*Addressee*, *Subject* or *Message*). To make the keyboard disappear, click again on the area.
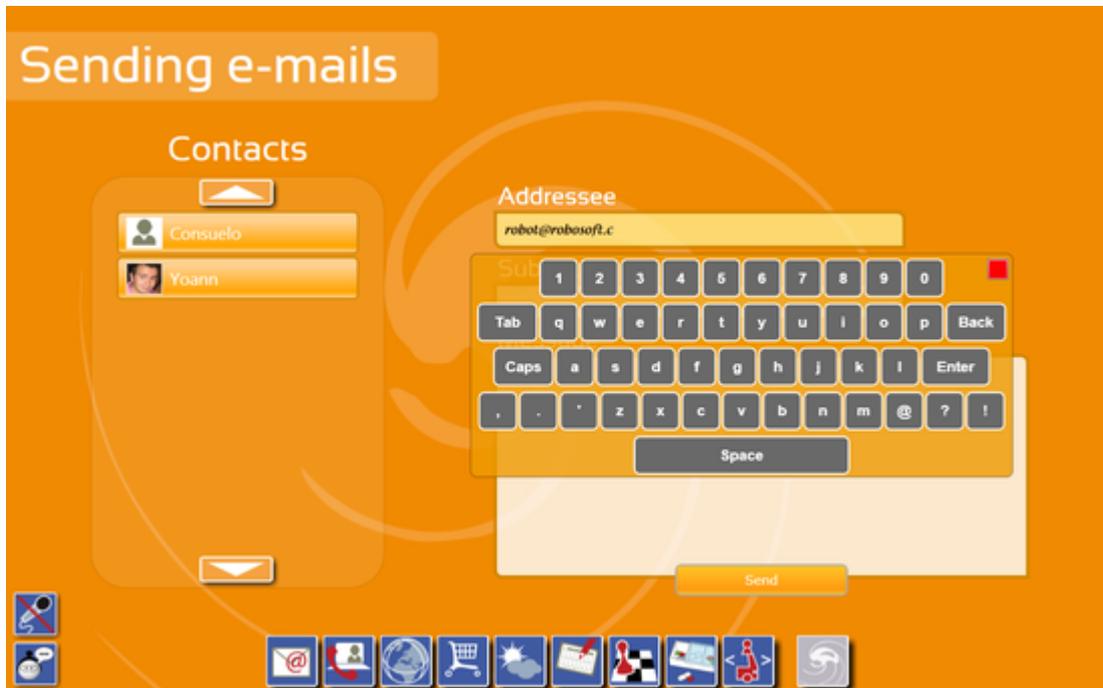
Figure 10: mail page with virtual keyboard

4.1.3.2. Video calls

This page allows starting a video call through Skype. It can be automatically displayed after the end-user accepts an incoming call with the pop-up window.
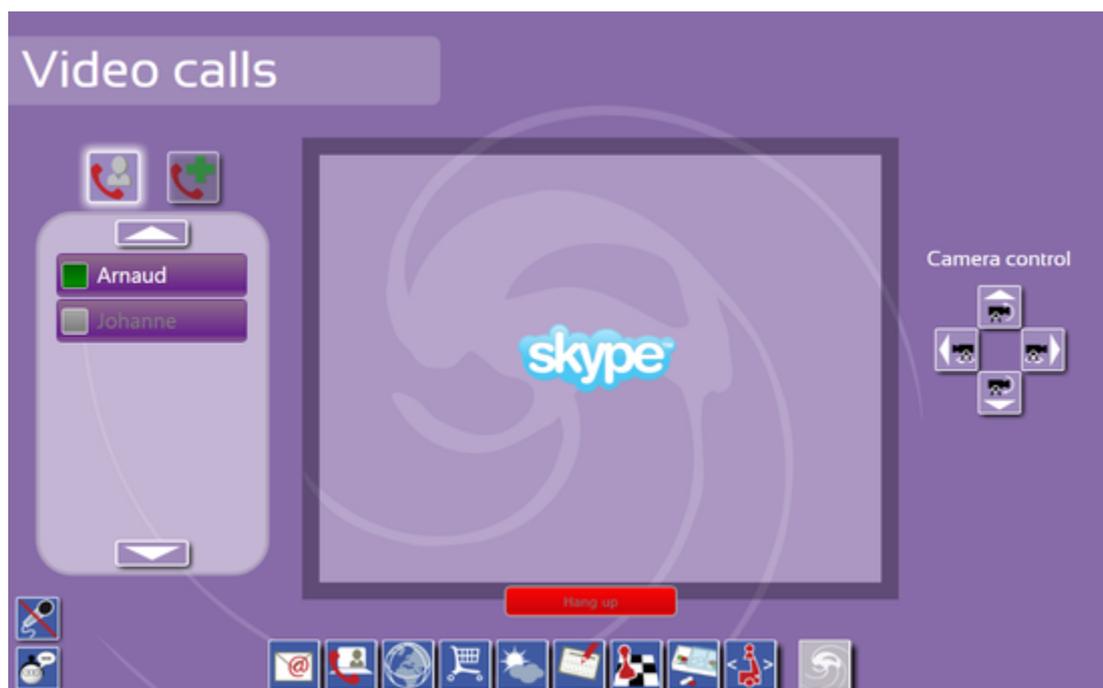
Figure 11: Video call s page

On the left side, contacts are listed by buttons. There are two kinds of contacts: end-user's relatives and healthcare-related contacts. The end-user can switch between categories using the two buttons. Depending on their online status these buttons are enabled or not and they are all disabled during a call. In the screenshot above, only one contact is currently connected. On-line status and contacts availability can evolve with time.

Figure 12: Video calls contacts

During a video-call, the video is automatically displayed on the central frame. The end-user can end a call using the red *Hang up* button, he/she can also control the USB camera at any time with the four control buttons located on the right hand side.
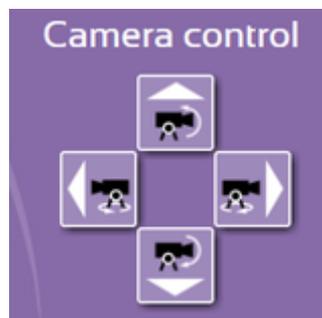
Figure 13: Video calls camera control

4.1.3.3. Web browser

Figure 14: Web browser

This page contains a classical web browser. Some favorite websites can be displayed under "Favorites" on the left side; they are defined in a configuration file. The users just have to touch one of them to access the related website. Navigation through pages can be done using the classical "previous" and "next" arrows located above the web browser.

4.1.3.4. Shopping List

Figure 15: Shopping list

On the left side, the end-user can choose between several products divided in five categories:
- Fruits
- Vegetables
- Fishes and meats
- Beverages
- Miscellaneous

4.1.3.5. Weather forecast

This page allows seeing the current weather conditions, temperatures and next days forecast.
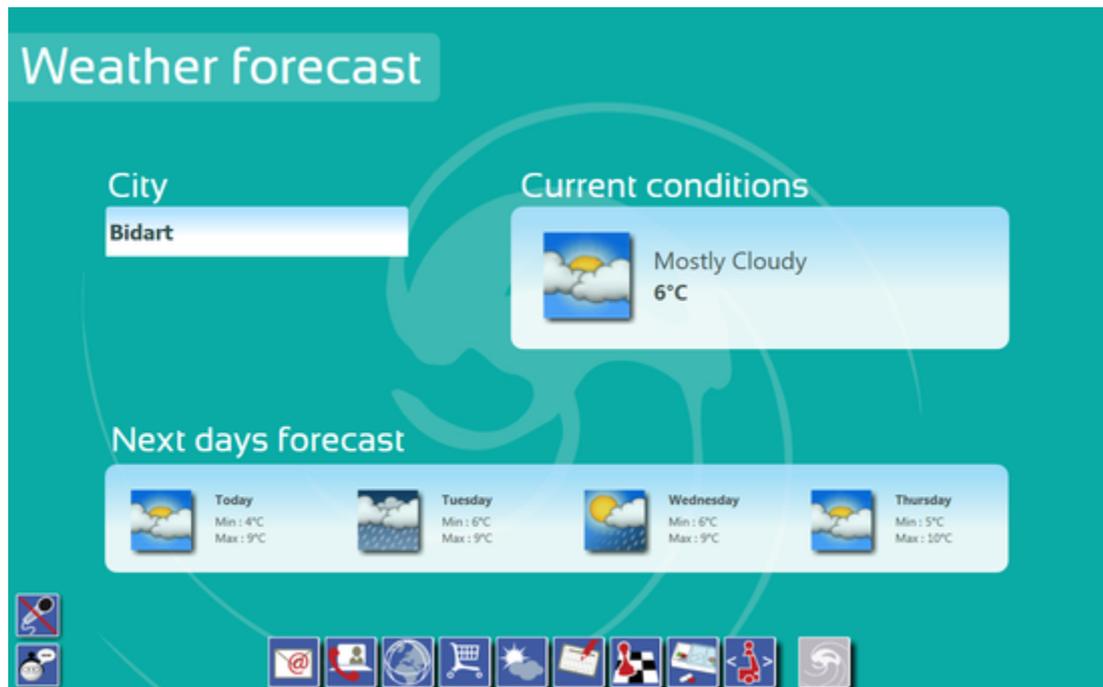
Figure 16: Weather forecast

4.1.3.6. Agendas

This page mainly shows a calendar where are combined two Google agendas which are respectively used for personal events and medical appointments. If an alarm is set, the alarm time will be displayed in the top right corner.
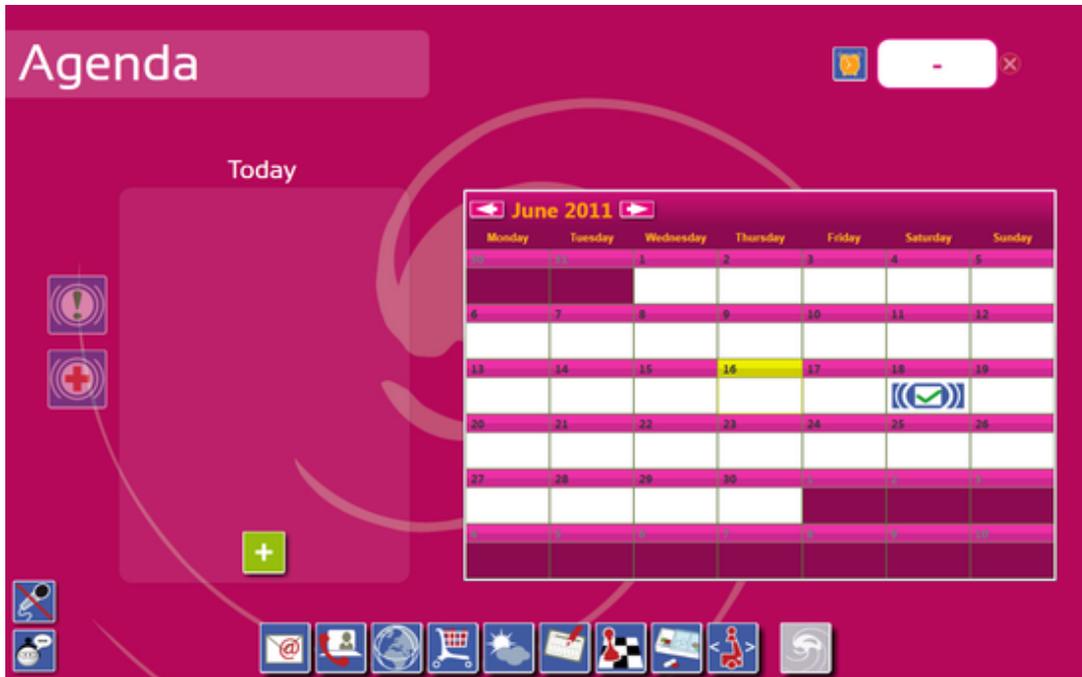
Figure 17: Agenda

4.1.3.7. Games

The end-user can play up to six flash games thanks to this page. Click on one of the six game icons displayed on the right side frame to start. When switching from one game to another nothing is saved and a new game has to be started again.
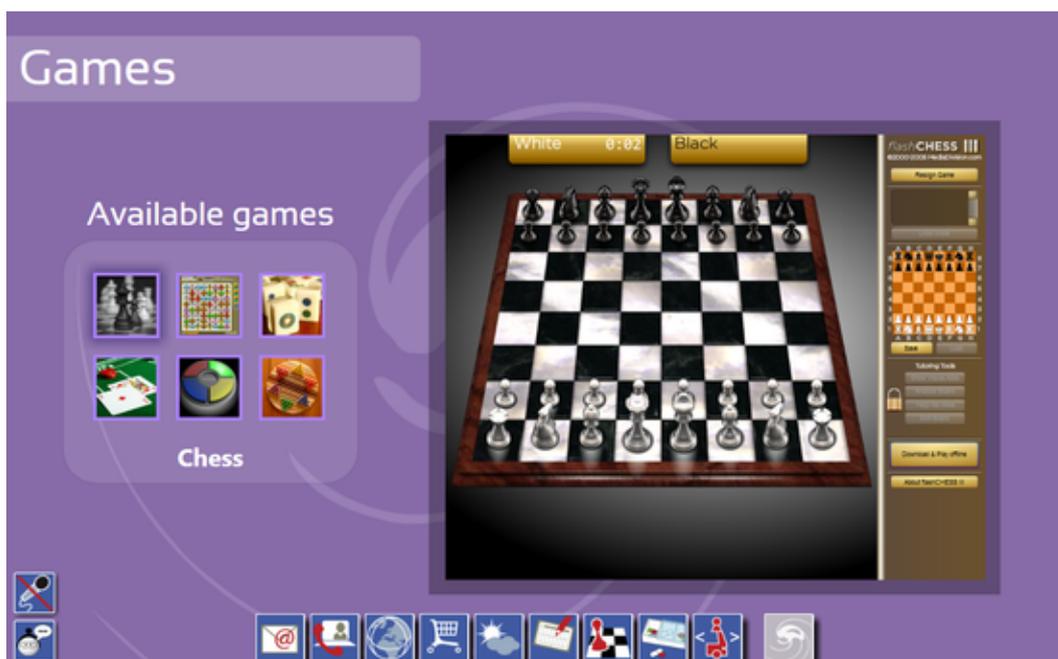
Figure 18: Games

4.1.3.8. Health manager

In the "Medication" frame, the end-user can see the medication he/she has to take during the current time slot. When a medication is correctly taken, the end-user can notify it by touching the graphical element which will turn to green. Medication to take remains blue and unchecked.

If the end-user forgot to take a medication during a previous time-slot (or forgot to notify that he/she took it), these medications are listed in the "Missed medication" frame (with the name of the time slot they belong to). The end-user can notify that he/she actually took the medication or that he/she doesn't care by touching the graphical element which will delete it.
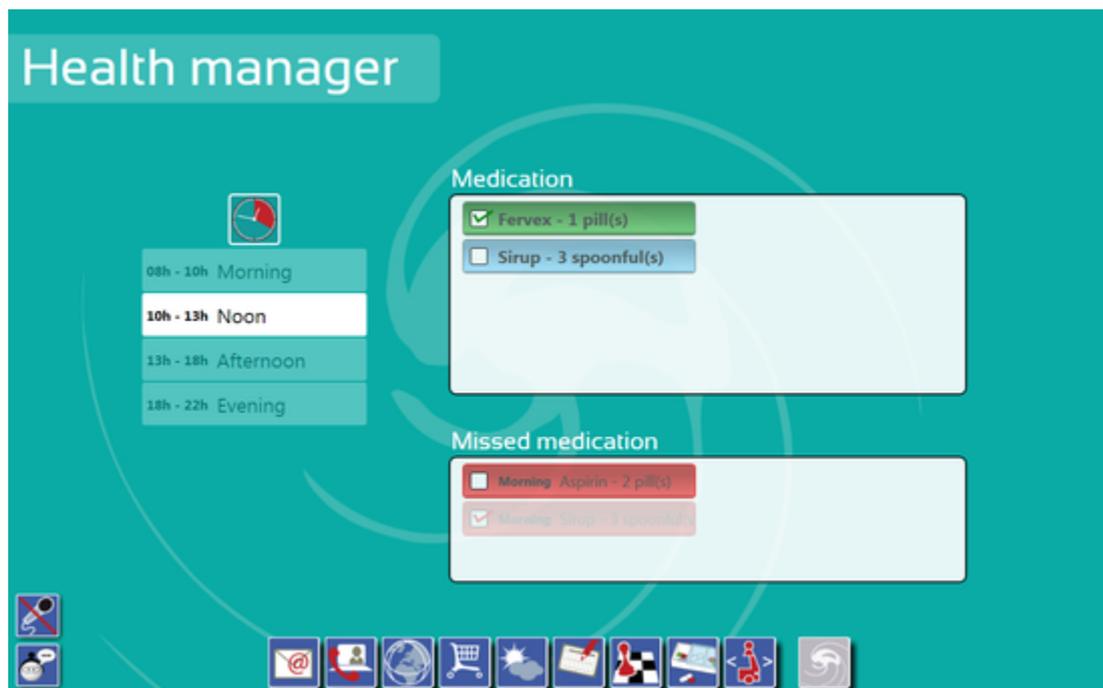
Figure 19: Health manager

4.1.3.9. Navigation

The robuMATE/Kompaï robot is able to move autonomously inside a known environment symbolized by a map used for localization and navigation. It is able to detect an obstacle on the path followed and bypass it if it is possible or stop in front of it.

The building of the map is done during the installation phase by an operator, by driving the robot slowly over the environment. The operator can modify manually this map to add some forbidden area.

Once the map is created and tuned, some point of interest can be added by the operator by driving the robot to those locations and store them.
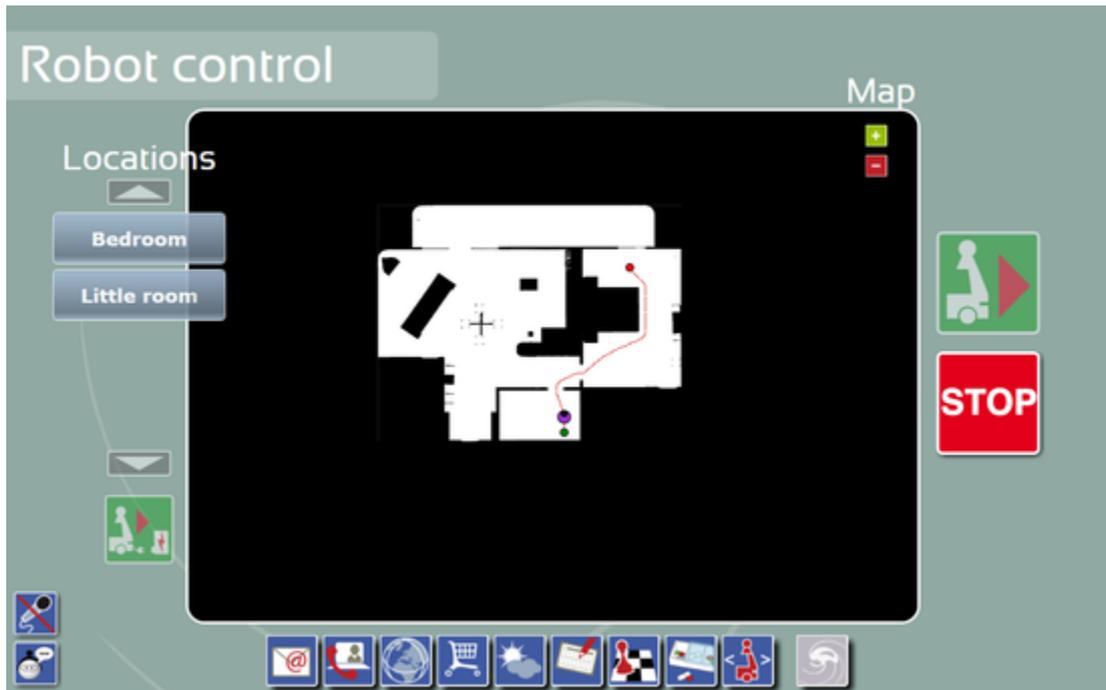
Figure 20: Navigation

4.2.   Robot used thought Lokarria

Lokarria can be used from any internet connected computer. Use either Google Chrome or Mozilla Firefox web browsers to connect on. The webpage can be added as bookmark.

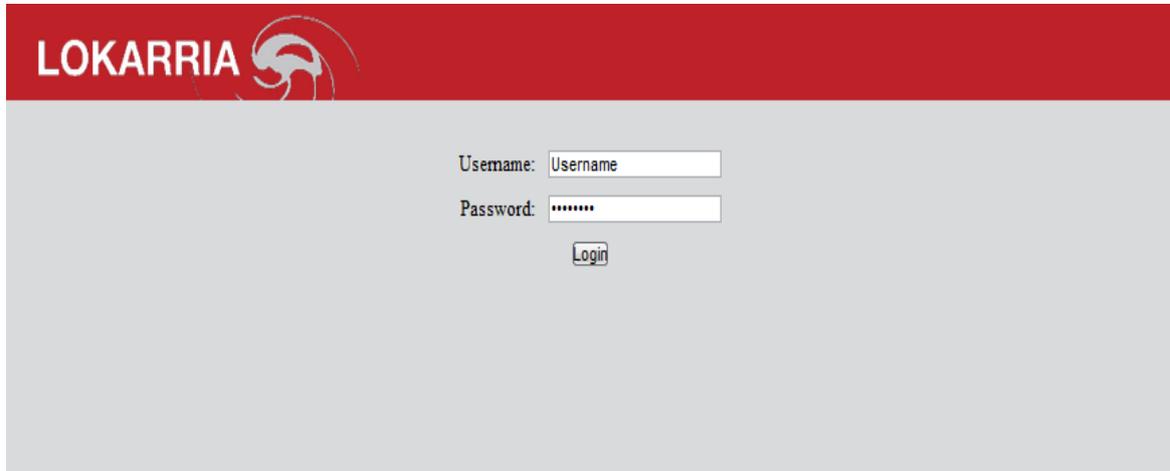It should be used for tele-presence or doubt removing.

Figure 21: Lokarria logging page

Use the identifiers provided by Robosoft to log in and to access to the Lokarria dashboard.

4.2.1. The Dashboard

The dashboard is the main page of Lokarria. All the robots you can access are listed and the names of those which are currently connected are displayed in green. For example, in the screenshot below, only one robot is available for the user account and it is currently running.
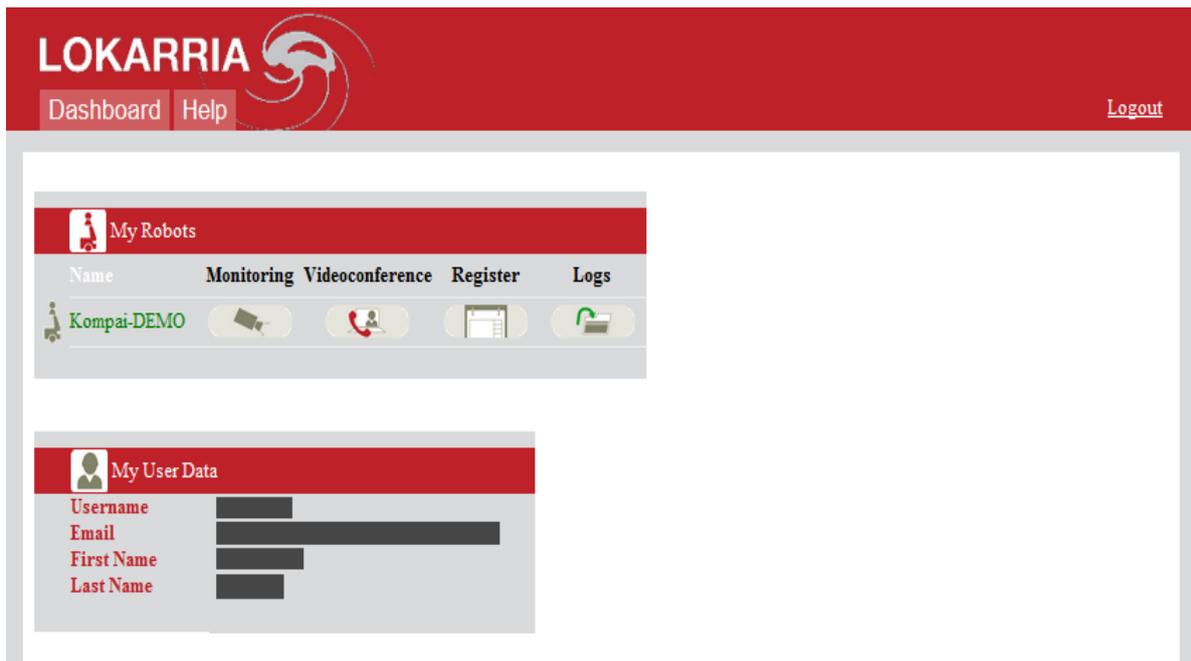
Figure 22: Lokarria dashboard

For each robot, four pages are available:

- **Monitoring:** see "Remote robot control" section below
- **Videoconference:** see "Video Conference" section below
- **Register:** add commentaries about actions done.
- **Logs:** give access to the main logs of the robot.

Click on the corresponding icon to reach the pages.

4.2.2. Remote robot control

On this page, the image from the IP camera located at ground level and the laser are displayed on the left side. On the right side, it's the map of the area where the robot is displayed. The current location of robot is the red point. Points of interest of the area are listed below the map.
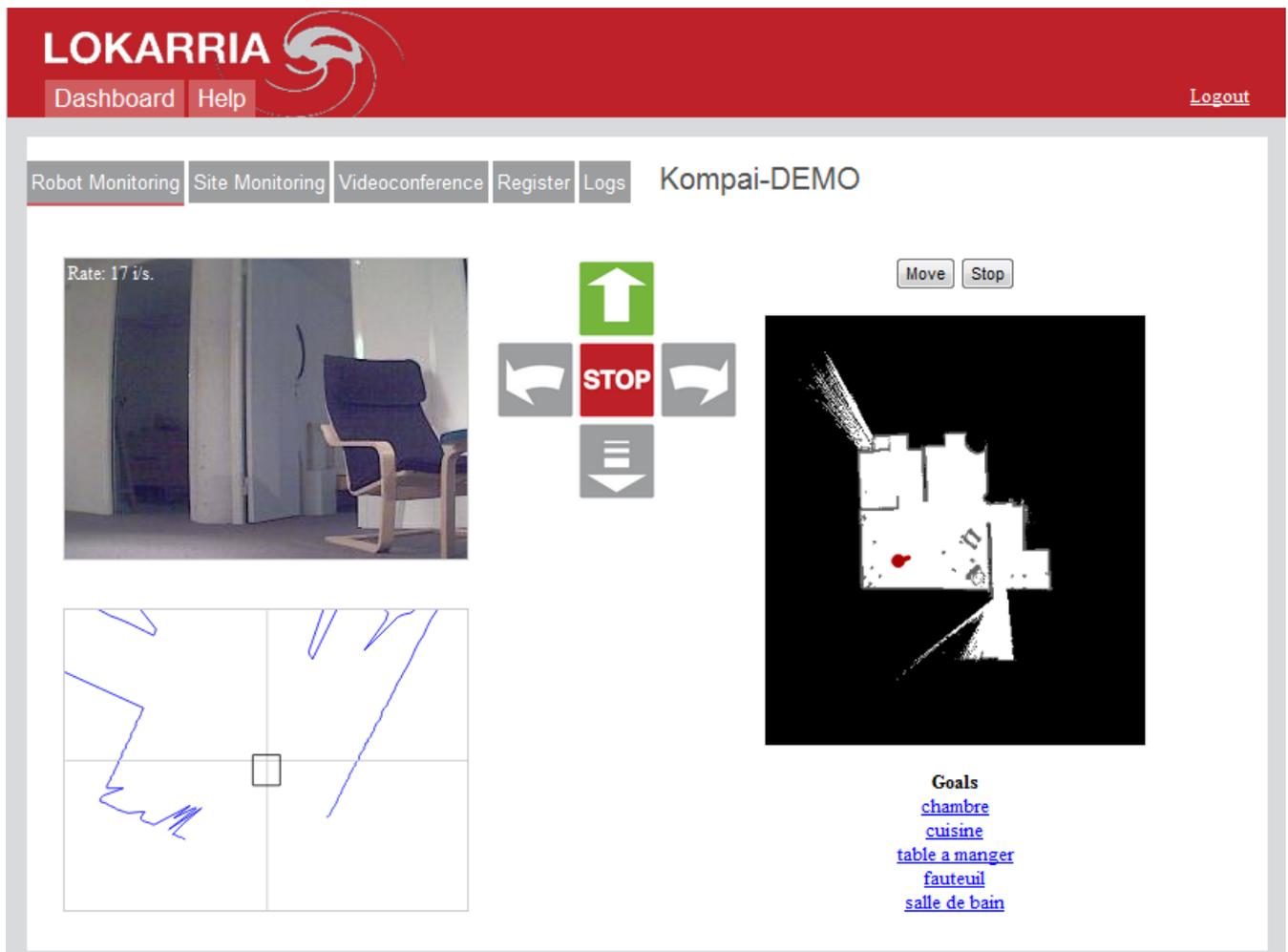
Figure 23: Lokarria monitoring

The user can use the control buttons located on the center to drive manually the robot. Double-click on the map or click on a registered goal, wait for a path to be displayed in green on the map and then press the **Move** button. Any movement can be stopped using the **Stop** button.

4.2.3.Video Conference

This page allows the user to join an **Oovoo** video chat room and to make also automatically the robot to join it.

First, log in to the Video chat room using any name and wait for your webcam image to be displayed.
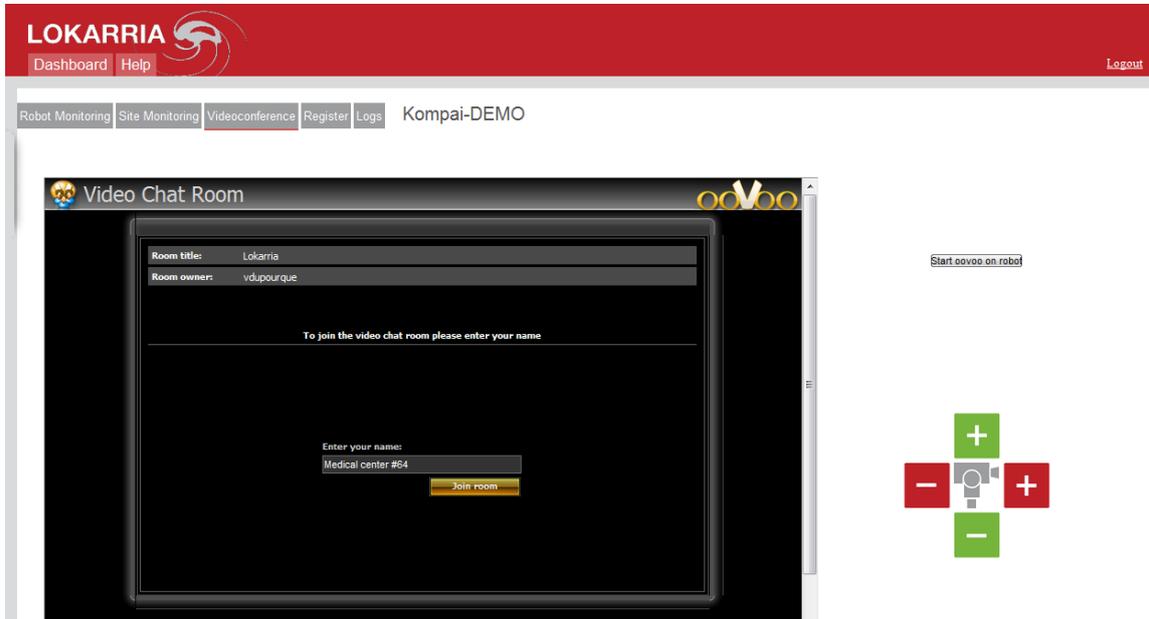
Figure 24: Lokarria video conference logging

Then, click on the **Start oovoo** on robot button. This will force the robot to join the room, just wait few second and the video coming from the head of the robot should appear. The buttons located on the right side allows controlling the webcam on the robot side.
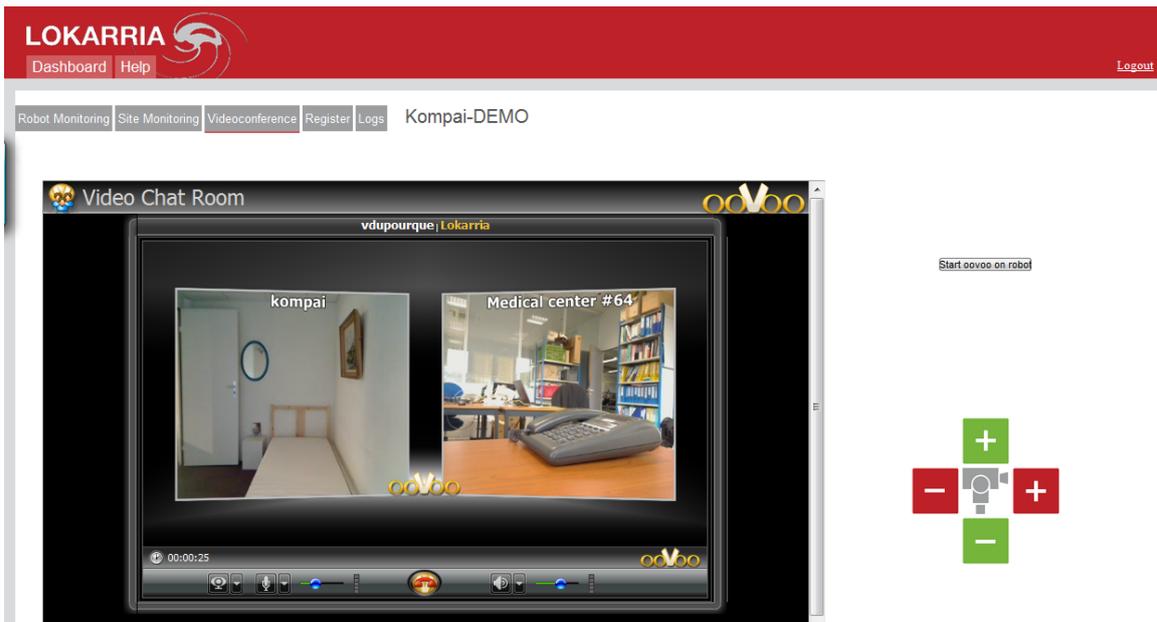
Figure 25: Lokarria video conference

To stop the video call on the robot side, click again on the **Start oovoo on robot** button.

4.2.4. **Register**

This page is used to keep trace of actions from remote users.

Figure 26: Lokarria register

4.2.5.Logs

From this page you can get back logs of robots into excel format.

Figure 27: Lokarria logs