KompAï Robot for robotized compreheNsive GeriatrIC Assessment (ARNICA)

Specifications after 6 months

Reference:	ECHORD++ PDTI
Responsable:	Robosoft Services Robots
Revision:	A01
Version date:	June 24th 2016

Confidentiality level:

- ☒ Strictly confidential – Internal use only
- ☐ Strictly confidential – Restricted access to:
- ☐ Not confidential – Public

Client:	EC- Echord++
Project:	ARNICA
Product:	Kompaï-CGA

<table>
<tr><td></td><td>Description of requirements after Phase I
(see also the Evaluation Matrix for important factors to mention and how your description will be evaluated)</td><td>Description, in detail, of how the different aspects are addressed after 6 months (Phase I) as preparation of the on-the-spot evaluation in Barcelona (July 2016).</td></tr>
<tr><td colspan="3">**General requirements**</td></tr>
<tr><td>Overall system</td><td>Specification of the overall system setup with geometric parameters, weight of the system, and description of interaction modalities. A single prototype, essentially, with mock-up functionalities, see below.</td><td>Through ARNICA, we offer to use the Kompaï robot as a device helping with Comprehensive Geriatric Assessments. The robot is already being used to assist elderly people at home, in institutions, and in hospitals. The CGA module can be considered an extension of the robot's functions, as illustrated in the following figure.

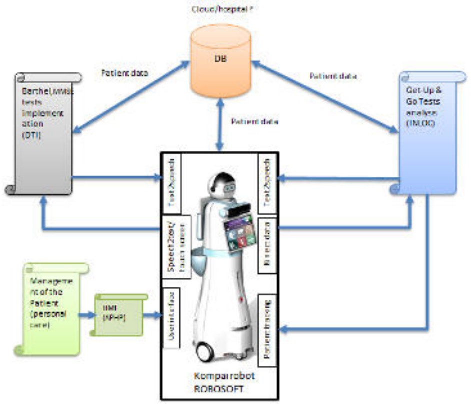
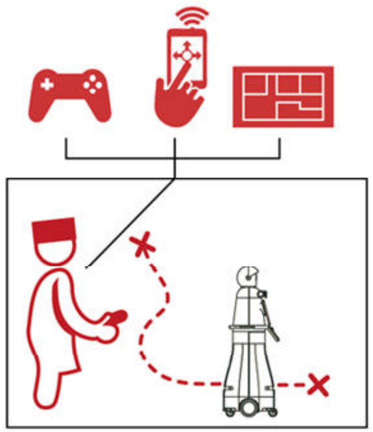
Figure 1: Kompaï robot assisting elderly


Figure 2:System architecture

Main features of the mock-up using Kompaï:
• Weight: < 50Kg;
• Motorization: Electric
• Locomotion: 2 motorized wheels in the center + 2 caster wheels (one front and rear)
• Overall size: Height x Width x Length = 1330 x 460 x 460 mm
• Energy: Battery-powered
• Autonomy: Up to 8h
• Interaction with users: Voice and touch screen modalities</td></tr>
</table>

Weight	Describe all specifications concerning the weight of the solution. The specified system must be portable by a normal human, the first prototype can be bigger/ heavier, but need to give an impression of the final one at the end of Phase III.	The weight of the mock-up using the Kompaï robot is under 50Kg. As it is a wheeled system, it has two ways of moving : a) in manual mode using the gamepad provided, or b) by releasing the brakes and pushing it.
Mobility	Mobility is closely connected with the afore described weight criteria of the system and addresses the platform's ability in terms of person following, face tracking, and similar advanced features.	In automatic mode, 3 ways for medical staff to control the motions of the robot : 1. Point of interest (when mapping is available) : tell the robot where to go, for instance "go to office 3". Medical staff can add or remove Point of interest in a simple way by themselves 2. A "follow me" (under development). The robot track the person using its front laser and the Kinect camera. 3. Remotely using a PC or Smartphone  *Figure 3: The 3 ways to control the robot motion*  *Figure 4: Example of a remote control interface (PC or smartphone)* With regard to vision aspects, in this first phase, we implemented a system which is able to extract the 3D movement of a person performing a Get Up & Go test. The current module is hence able to track a single person in the scene. Face tracking, and other advanced features, as tracking other body-parts (for hands, feet, knees, etc), as well as extending the current module to multiple persons or dealing with partial occlusions, will be implemented in Phases II and III (specified in Appendix 4).

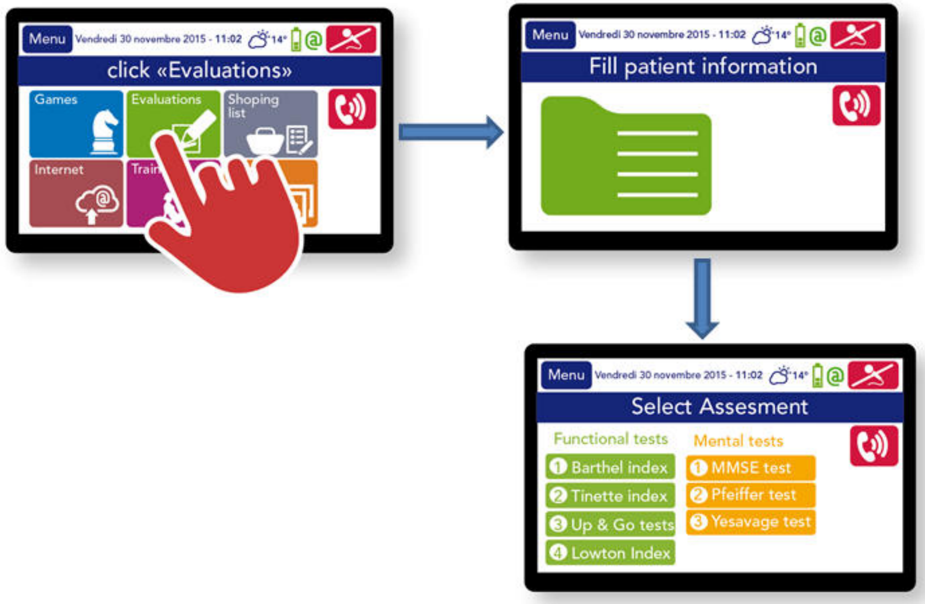
Power supply	The specified system must be able to be operated both in battery mode for at least 8 hours, as well as in plugged-in mode, the first prototype can be powered by cable. For the final systems, inability to operate in battery mode may be a critical problem because the device will be used in patient's rooms or in small places where plugging may be complicated.	The system is battery-powered for autonomous tasks and can be connected to a standard 220/230VAC power supply using the charger. In function of its use, autonomy is approximately 8h when fully charged. The robot comes with its own docking station to automatically recharge when it is not in use.
Language interface	Technical concept and prototype of a robust natural language interface which allows for multi-language support. Prototypes in stage I and II can use any European language (preferably English, Spanish, or Catalan), but the capability for multi-language support has to be demonstrated.	In this first phase, we propose using a method interpreting a set of standard pre-defined answers with multi-language support (English and Catalan for the moment). An alternative mode of interaction through a touch screen tool is also offered.
GUI design Touch-screen interaction	Mock-up of touch-screen based interaction for all sorts of dialogues, for tests, configuration, and evaluation/data management. Other, yet easy to use and robust interaction modalities besides spoken language are also possible for the tests. They need to be able to be used if the natural language interface is not suitable, e.g. when a patient is not or only hardly able to speak. Also here, the multi-language issues apply in the same form as described above.	**Mock-up of GUI interface:** 1- Since the CGA module is added to the standard Kompaï GUI interface as an additional function, the screens below illustrate how to launch the CGA module from the Kompaï GUI interface: 

Figure 5:GUI interface to launch CGA module

2- The questionnaire was implemented according to the following story board:

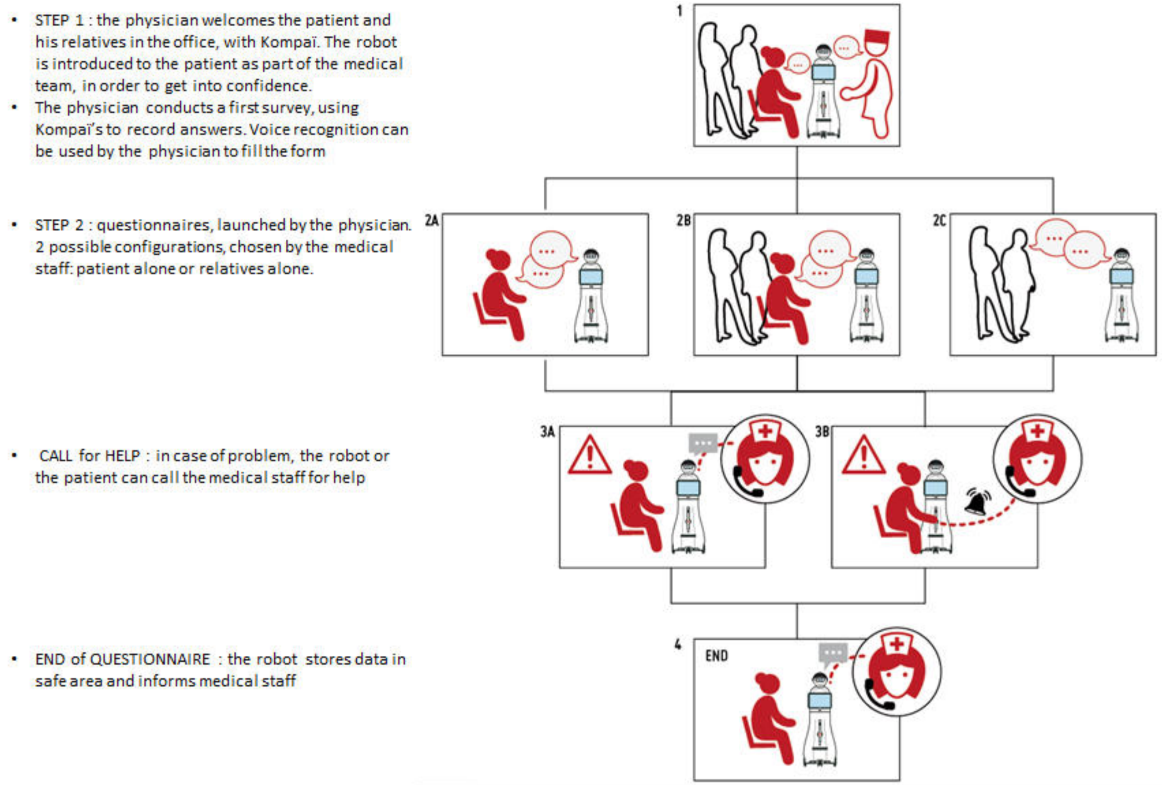


Figure 6:Storyboard

Some screenshot from Barthel (right) and MMSE (left)

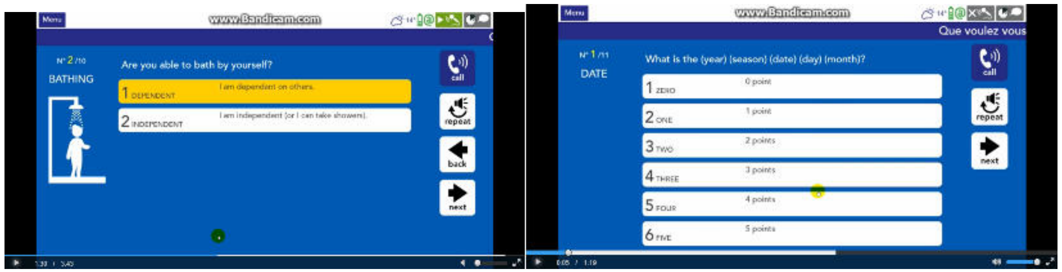


Figure 7: Screenshot from Barthel (right) and MMSE (left)

Some screenshot from Get Up & Go Test

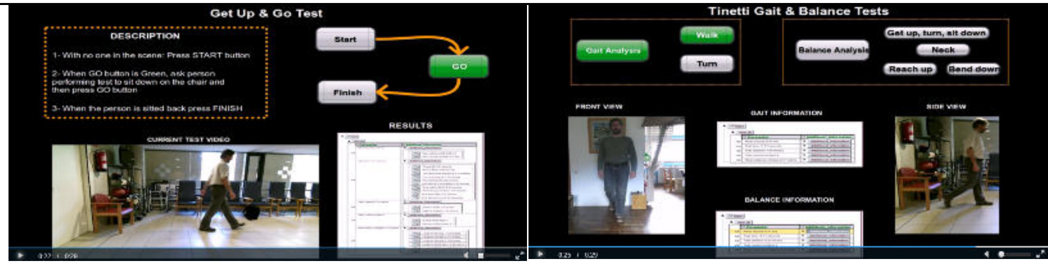


Figure 8: Screenshot from Get Up & Go Test

Data management

Data storage

For each test, there are 2 possible ways to store and manage collected data:

- The robot connects to the big data space to store personal anonymized data, as illustrated in the following figure:

Figure 9: Data management through cloud services

<u>Example of file</u>

{"tsStart":1464009030312,"tsEnd":1464009036121,"patientName":"kompai","questionId":10,"results":[{"question":"FEEDING","answer":{"name":"UNABLE","answer":"I am unable to eat by myself.","score":0}},{"question":"BATHING","answer":{"name":"INDEPENDENT","answer":"I am independent (or I can take showers).","score":5}},{"question":"GROOMING","answer":{"name":"INDEPENDENT","answer":"I am independent in face, hair, teeth, shaving grooming.","score":5}},{"question":"DRESSING","answer":{"name":"NEED HELP","answer":"I need help but I can do about half unaided.","score":5}},{"question":"BOWELS","answer":{"name":"OCCASIONAL","answer":"I have occasional accidents.","score":5}},{"question":"BLADDER","answer":{"name":"OCCASIONAL","answer":"I have occasional accidents.","score":5}},{"question":"TOILET USE","answer":{"name":"NEED

HELP","answer":"I need some help, but I can do something alone.","score":5}},{"question":"TRANSFERS (BED TO CHAIR AND BACK)","answer":{"name":"MAJOR HELP","answer":"I need major help (one or two people, physical), I can sit.","score":5}},{"question":"MOBILITY (ON LEVEL SURFACES)","answer":{"name":"WHEELCHAIR","answer":"I am wheelchair independent, including corners, I can move more than 50 yards.","score":5}},{"question":"STAIRS","answer":{"name":"NEED HELP","answer":"I need help (verbal, physical, carrying aid).","score":5}}],"totalScore":45}

- The robot adds the data to the patient's information items in an XML file and send it to the GOWIN software interface

Data analysis:

- The doctor can compare results with previous evaluations directly on the robot’s screen using the 2 dashboards we are providing, one for Barthel, MMSE tests (left figure) and one for Gait analysis (right figure)

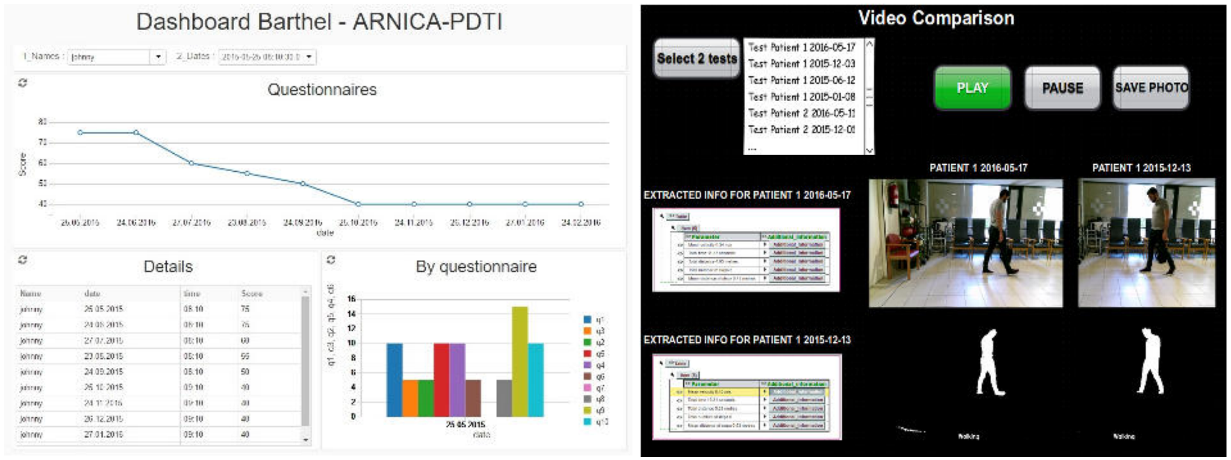
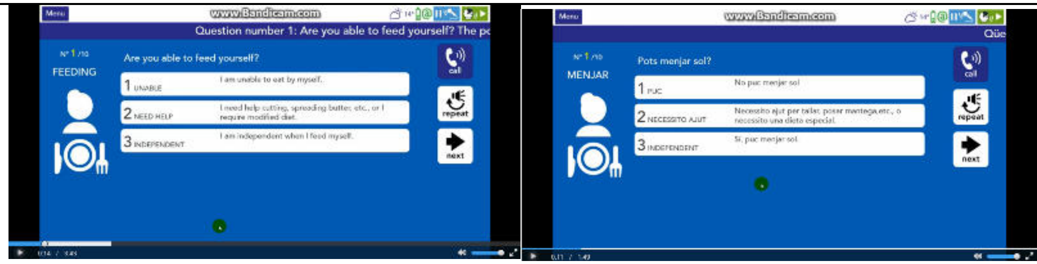


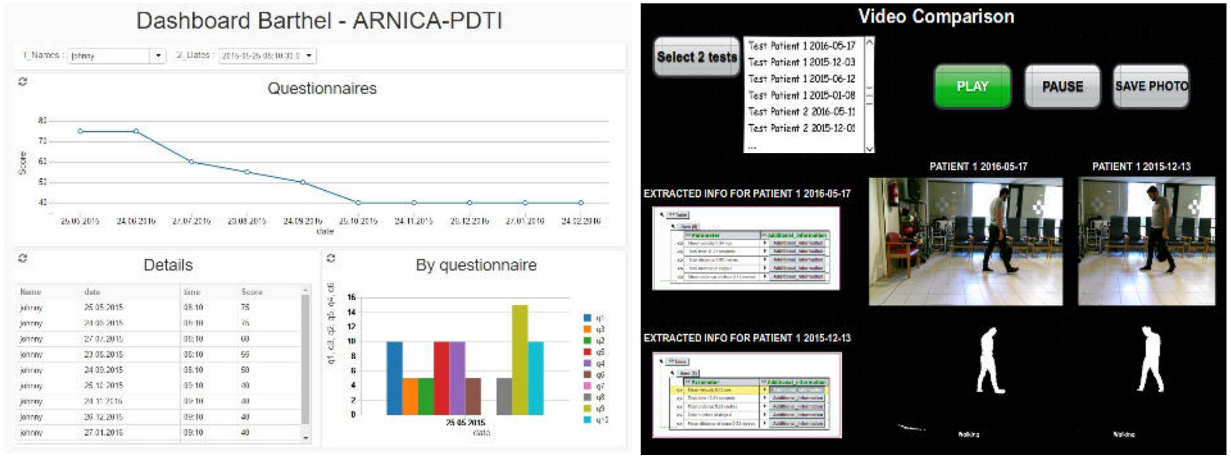
Figure 10: Dashboard

Multi-language capabilities

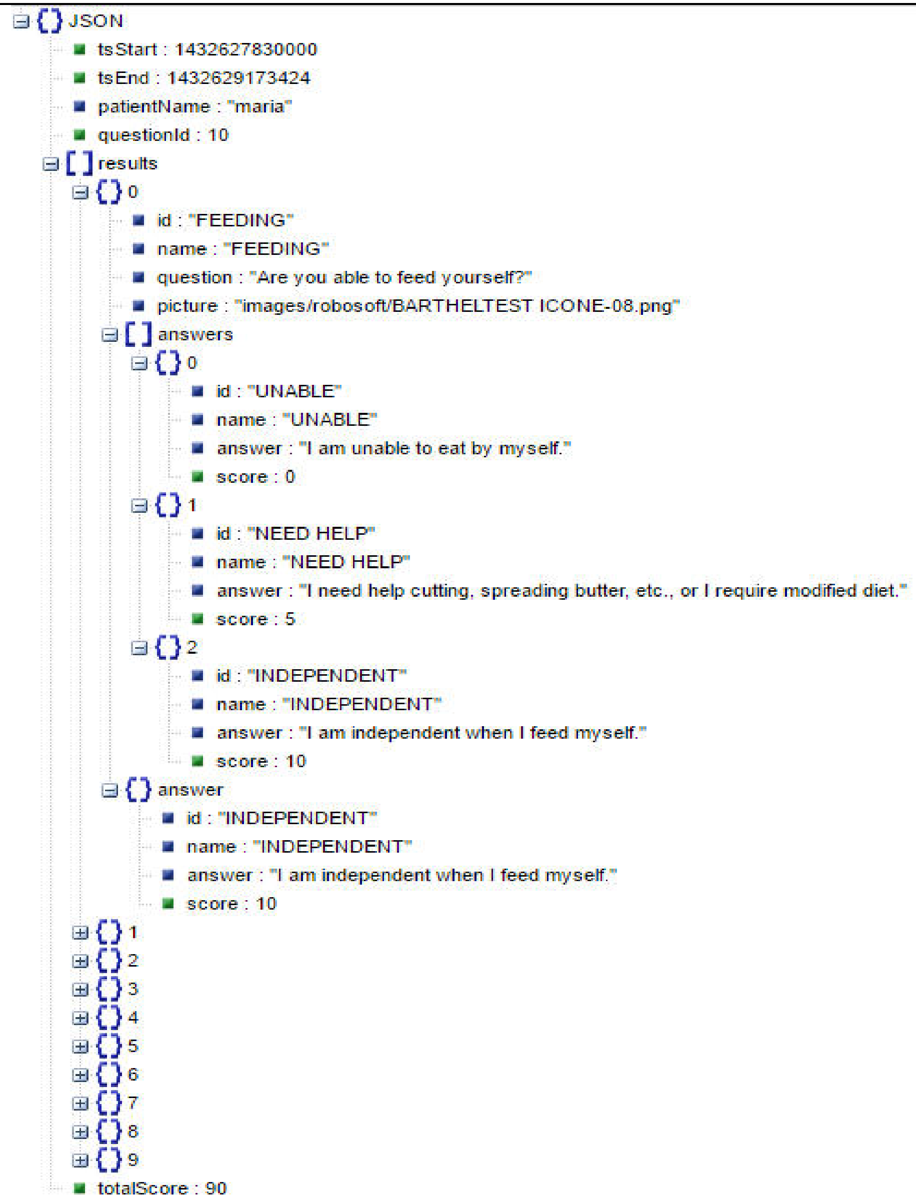
As you can see in the following figures, the implementations we made uses English and Catalan for this first phase. More languages will be considered in the following phases.

		 *Figure 11: Multi-language capability (English version « left » ; Catalan version « right »)*
Motion tracking	Concept and exact specification of the motion tracking system with planned analyses in context of the Get up & Go test and the Tinetti Balance and Gait tests	In Phase I, we focused our efforts on demonstrating our ability to extract the parameters useful for a patient's motion performance evaluation. As described further in the actual tests section, some assumptions were made which will be generalised in subsequent phases, including an automatic performance analysis tool. The current implementation of the motion tracking component: - Uses a RGB-D camera, provides classic color images plus depth information about the scene observed to generate 3D information. - For hardware, we use data received with the popular Kinect camera (latest model). This camera was selected among other RGB-D cameras mainly because of its price, but also because it enables rapid design and prototyping. Though this selection, our module is not attached to this specific hardware, it is designed to work with other RGB-D sensors. - The functionalities developed are not based on any proprietary software suite or SDK. We used custom-developed algorithms implemented with C++ (obviously subject to IP rights), an open source driver for the camera, and basic functionalities from OpenCV suite (mainly data representation objects). Hence, our implementation is platform-independent, modular and scalable, so it can evolve through Phases II and III and incorporate other motion-based tests, like the Tinetti balance and gait tests. This is a principal interest of having INLOC as a partner for ARNICA. - Our approach currently involves: • Markerless solution: there are no need for markers on the body of the person studied, or for color-specific clothing. • Robust to light conditions • Robust to changes in its environment, including furniture change, etc. - Our technical approach includes:

		• Background learning. We start by taking images of the place where the test will be conducted and learn a 3D environment model. To achieve this, we use a per-pixel 3D Gaussian modelling approach together with data de-noising techniques, the process stops when the noise of the environment model is below 5%. • Foreground extraction. Once the person is seated in the chair, we extract the person figure from the environment model, by performing a 3D model comparison. • From the extracted person figure, we obtain a 3D point cloud representation of the person being observed. • Single-person tracking. Based on the 3D point cloud representation of the observed person, we obtain, frame to frame, the moving pixels and can track the single person. • From the obtained sequence, we are currently computing the centroid of the 3D point cloud, and use its projection on the ground plane to obtain the desired parameters and calculate a best-fit line to represent the direction of travel for the walking sequence. • With our 3D model, we can identify the person's different stages: sitting, getting up, walking (GO), turning, coming back (BACK), turning, sitting down, and sitting again. Based on that, the parameters we are currently computing with our module are: • Mean Velocity o Mean velocity at GO o Mean velocity at BACK • Total Time o Time at GO o Time at BACK o Time seated at the beginning o Time for getting up o Time walking GO o Time turning to come BACK o Time walking BACK o Time turning to sit down o Time to sit down o Time seated at the end • Total Distance o Distance at GO o Distance at BACK • Mean Length of Steps o Length for each step when GO o Length for each step when BACK • Total Number of Steps

		○ Number of steps at GO ○ Number of steps at BACK
Evaluation and Data Management		
Patient-specific view	Mock-up of the dashboard for one patient's data including his development in test results, and access to raw data, such as answers given in a specific test or videos and other visualization of the motion analysis.	The following mock-up of the dashboards was developed in order to monitor patient's data. Using this dashboard carers are able to access all collected data for further analysis and comparison between current collected data and previous ones.  *Figure 12: Dashboard for Barthel/MMSE tests (left); Dashboard for Gait analysis data (right)* For the motion analysis, the implementation carried-out for the Get Up & Go Test demonstrates that we are able to capture and store video from mobility tests in order to record the patient's performance. As proposed, in order to store results from the module, we create a new folder for each separate run with the name, the date of the test (year_month_day). It is easy to configure in our software other names for the folders/output files if needed by the hospital IT service (for instance including the reference of the patient being evaluated, the name of the test being performed, etc.). This can make it easier to perform automatic comparison of videos at a later time. As mentioned above, provided videos are given using open-source implementations of media formats (so called video codecs) to avoid possible fees due to registered patents. Xvid was used for the current mock-up.

Analysis of results	Concept to interpret and codify the patients or relatives' answers in selected tests and to calculate test scores based on codified information. The Health Professional has to be able to modify or correct tests scores	**Concept of codification for Bathel and MMSE tests**
		
		JSON formatted data:
		• tsStart: timestamp of the beginning of the test
		• tsEnd: timestamp of the end of the test
		• patientName: an identifier of the patient
		• questionId: current question index
		• results: list of answered questions
		  ○ id: id of the question
		  ○ name: translated name of the question
		  ○ question: translated question
		  ○ picture: path to question asset
		  ○ answers: list of available answers
		    ▪ id: id of the answer
		    ▪ name: translated name of the answer
		    ▪ answer: translated answer
		    ▪ score: corresponding score
		  ○ answer: the chosen answer
		    ▪ id: id of the answer
		    ▪ name: translated name of the answer
		    ▪ answer: translated answer
		    ▪ score: corresponding score
		• totalScore: the sum of the answers' score
		Example :



The following screen show how the Health professional can edit the questionnaire modify or correct score and save the file to be sent to the cloud or clinic data management system.

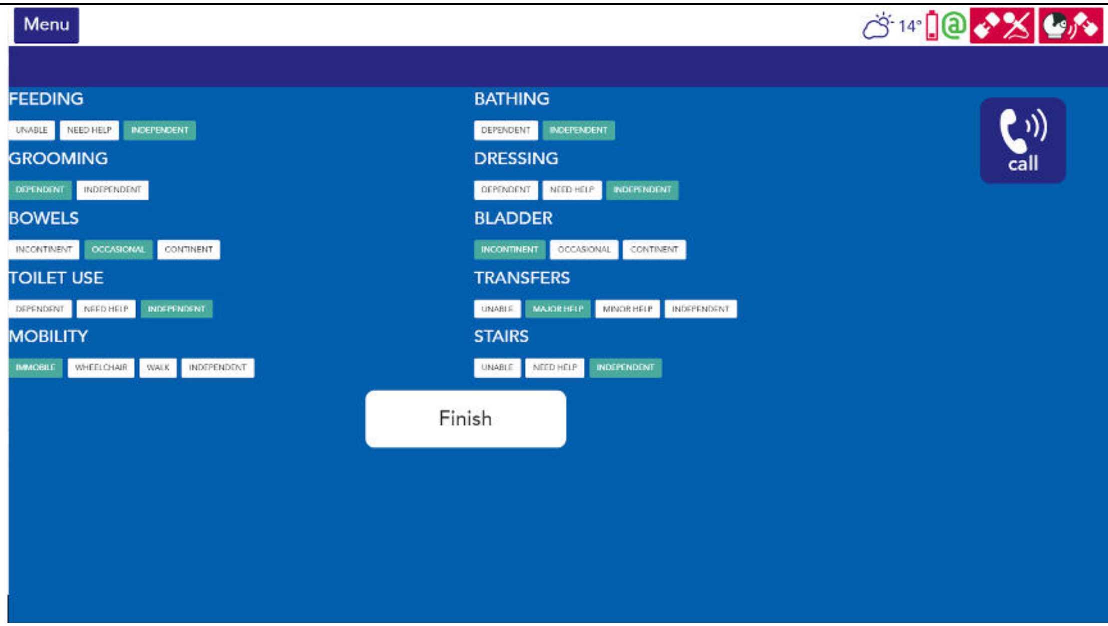


Figure 13: GUI interface screen to edit the questionnaire for further modification/correction by the doctor

For the Get Up and Go test, we are providing main figures as well as additional information about the test (which in fact, is more complete than current Tests being performed at the hospital, which, if useful for doctors, could even propose slight changes in the current way of evaluating the tests).

Basic information, as it has been checked with Doctors at ABAT, is composed of:

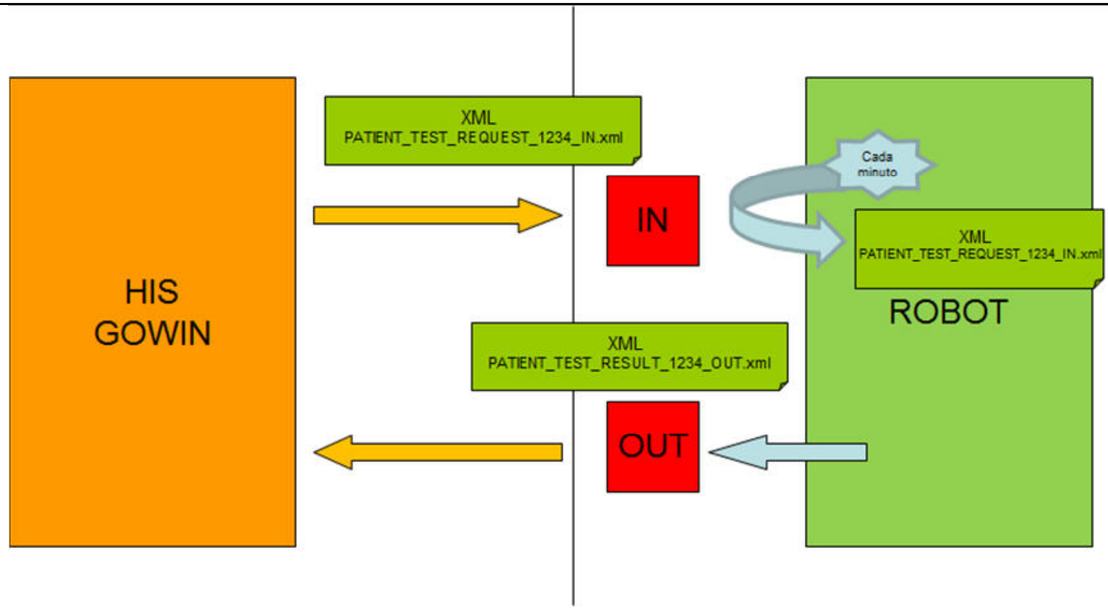
- Mean velocity
- Total time
- Total distance

The extraction of the basic information is robust in the mock-up implementation.

Additionally, as the module we have implemented for the Get Up and Go test is able to distinguish among the different actions of the person during the test (sitting, getting up, walking (GO), turning, coming back (BACK), turning, sitting down and sitting again) we are able to provide as well the following additional information:

- Mean Length of steps
- Total number of steps

		• Mean velocity at GO • Mean velocity at BACK • Time at GO • Time at BACK • Time seated at the beginning • Time for getting up • Time walking GO • Time turning to come BACK • Time walking BACK • Time turning to sit down • Time to sit down • Time seated at the end • Distance at GO • Distance at BACK • Length for each step when GO • Distance for each step when BACK • Number of steps at GO • Number of steps at BACK In our present mock-up, some extraction of additional information may fail or be non-exact, but it provides an idea of what can successfully be implemented in upcoming phases. All this information, basic and additional, is provided in an XML file (stored in the specified OUT directory) so it can be read by the GoWin software used at the ABAT hospital. Our module can also provide information about balance, since we have a 3D model of the person doing the test. This information has not been extracted for Phase I, but some images can be seen in Appendix 4, leaving a complete implementation for Phase II.
Integration into clinical data management	Outline of the possibility to interface with clinical data systems in the overall concept.	This integration is made through the GOWIN software interface. As you can see in the following figure, the robot adds the collected data to the patient's information items and sends them to the GOWIN software interface.

		 *Figure 14: Interface with clinical data systems concept to manage patient data*
Data protection	Description of data protection concept and fulfilment of standards.	Patient data is subject to protection and privacy with respect to transfer, storage, and processing. Data protection plays a significant role reducing or even inhibiting the processing of sensitive data (Art. 8 of Directive 95/46/EC) which includes personal health data. The processing of this data is also prohibited by the Convention for the Protection of Human Rights and Fundamental Freedoms. Given the importance of individual health data for providing the best medical treatment for a patient, the Directive 95/46/EC [95-46EC16] provides exemptions to the general prohibition in the Articles 8(2) and (3) permitting derogating from Art. 8(1) if: • The patient as a 'data subject' has explicitly, in the meaning of freely, specifically and in an informed manner, given his consent; • The processing can be justified by being in the vital interest of the subject, for example in life-saving treatment and when the person is not able to express his intention. The Article 29 Working Party illustrates this legal ground as follows: "assume a data subject has lost consciousness after an accident and cannot give his consent to the necessary disclosure of known allergies. In the context of EHR systems this provision would allow access to information stored in the EHR to a health professional in order to retrieve details on known allergies of the data subject as they might prove decisive for the chosen course of treatment; and • if they are processed by health professionals, subject to professional (medical) secrecy, for the purpose of preventive medicine, medical diagnoses or the provision of care and treatment or

		the management thereof. Data privacy refers to the evolving relationship between technology and the legal right to, and public expectation of, privacy in the collection and sharing of data. Privacy problems exist wherever uniquely identifiable data relating to a person or persons are collected and stored, in digital form or otherwise. Improper or non-existent disclosure control can be the root cause for privacy issues. Some big data providers start proposing services for personal data (storage, treatment …) with robust security standards. **For example, Amazon Web Services (AWS)'s Cloud Compliance, which we want to use in this first phase of the ARNICA project,** enables customers to understand the robust controls in place at AWS to maintain privacy and data protection in the cloud. As systems are built on top of the AWS cloud infrastructure, compliance responsibilities will be shared. By tying together governance-focused, audit-friendly service features with applicable compliance or audit standards, AWS Compliance enablers build on traditional program, helping customers establish and operate in an AWS security-controlled environment. With regards to Directive 95/46/EC, the Luxembourg Data Protection Authority (CNPD), acting as the lead authority, in cooperation with other concerned European Data Protection Authorities pursuant to the Working Document 226, adopted by the Article 29 Working Party, have analyzed Amazon Web Services, Inc.'s (AWS) "Data Processing Addendum" and its Annex 2 "Standard Contractual Clauses" which incorporates Commission Decision 2010/87/EU. The aim of the review by the Data Protection Authorities (DPAs) was to evaluate whether these documents strictly meet the requirements on international data transfers contained in the Standard Contractual Clauses of the Commission Decision 2010/87/EU (the so-called "controller-to-processor" clauses). On 6 March 2015, the CNPD issued a letter, confirming that the Data Processing Addendum of AWS was in line with the Standard Contractual Clauses of Commission Decision 2010/87/EU and acknowledging that, by using the "Data Processing Addendum" together with its annexes, AWS will make sufficient contractual commitments to provide a legal framework to its international data flows, in accordance with Article 26 of Directive 95/46/EC. Furthermore, the Luxembourgish DPA thanked AWS for the constructive collaboration that has led to these positive conclusions. AWS data centres are built in clusters in various countries around the world. We refer to each of data center clusters in a given country as a "Region." Customers have access to eleven AWS Regions around the globe, including two Regions in the EU – Ireland (Dublin) and Germany (Frankfurt). Customers can choose to use one Region, all Regions, or a combination of Regions. This allows compliance with specific directives for each country to respect this data. In privacy preserving data publishing, in order to prevent privacy attacks, data should be anonymized properly before it is released. Anonymization methods should take into account the privacy models of the data and the utility of the data. Anonymization techniques have been the focus of intense research

		in past years. An important requirement for such techniques is ensuring anonymization of data while minimizing information loss resulting from data modification. The literature presents two categories of anonymization methods: • <u>Clustering-Based Approach</u>: the anonymity model assumes that person-specific data is stored in a table (or a relation) of columns (or attributes) and rows (or records). The process of anonymizing such a table starts with removing all the explicit identifiers, such as name and SSN(or other identification number), from the table. However, even though a table is free of explicit identifiers, some of the remaining attributes taken together, could be specific enough to identify individuals if the values are already known to the public. This method's main objective is to transform a table so that no one can make high-probability associations between the records in the table and corresponding entities. • <u>Graph Modification Approach</u>: This method anonymizes a graph by modifying (that is, inserting and/or deleting) edges and vertices in a graph. The modification can be conducted in three ways leading to three sub-categories: The optimization approach tries to make up an optimal configuration and modify the graph accordingly. The randomized graph modification approach conducts perturbation. Finally, the greedy graph modification approach greedily introduces modifications to meet the privacy preservation requirement and optimize the data utility objectives. **In this first phase we are implementing the first method on the mock-up.** Possible benchmark in the following phases will be investigation through the other method.
Configuration		
Patient- specific configuration	Description of mock-up of system dialogues for selection of tests and definition of test sequences in form of flow charts, handling of patient data.	As you can see in the following flow chart the CGA module is launched from the main menu of the Kompaï application.

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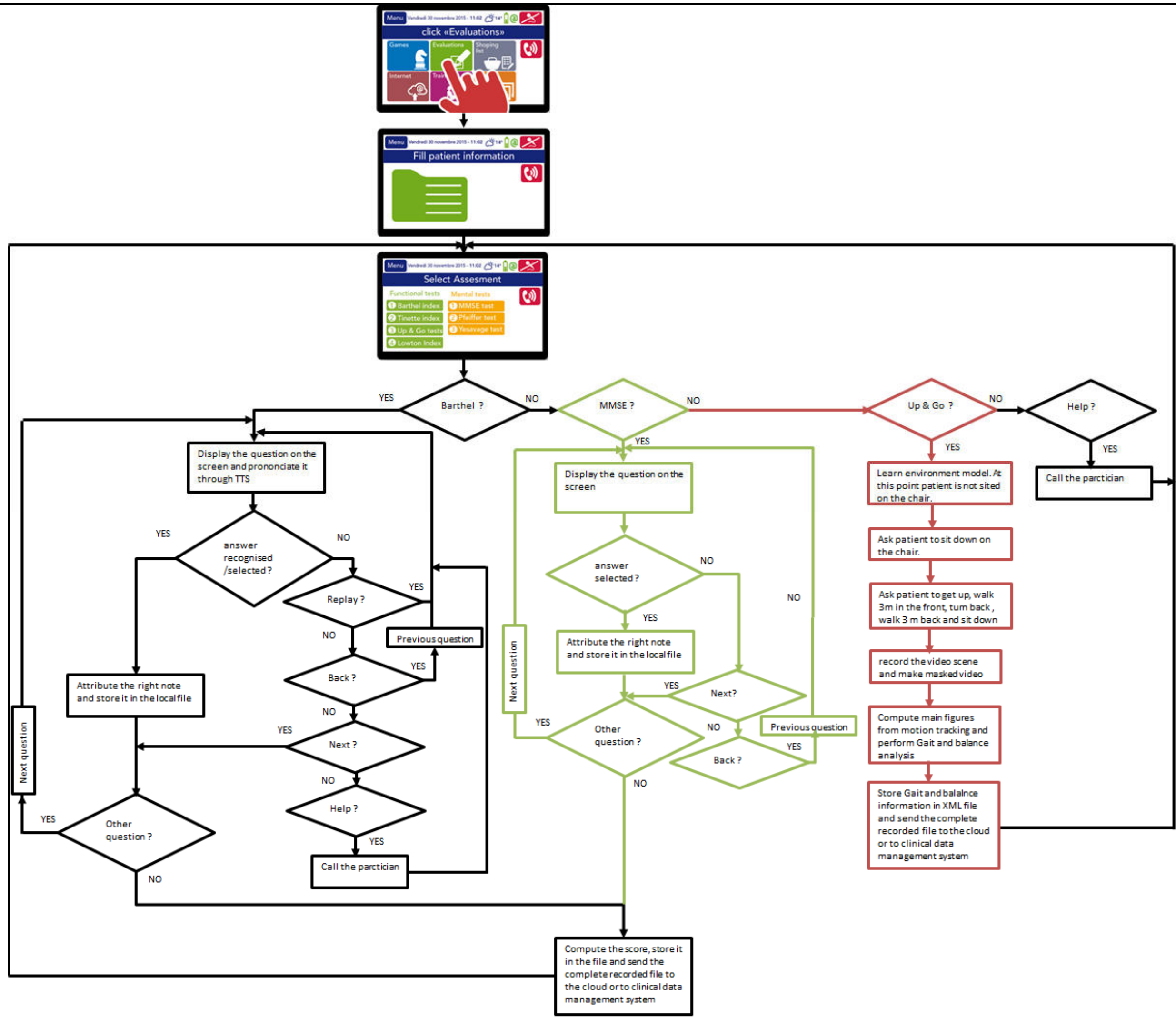
<td>

Figure 15: CGA implementation flow chart</td>
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<tr>
<td>Integration of new/additional tests</td>
<td>Description of mock-up of possibilities to develop a new questionnaire-type tests.</td>
<td>As described above, the GUI interface integrates the possibility of adding other questionnaires in the main menu. Thanks to web programming technology, any new questionnaire can be programmed easily without altering the existing questionnaire modules.

Regarding motion tests, the computer vision module developed by INLOC in ARNICA is modular and scalable. As explained above (see the motion tracking requirements section), it is C++ based and there is no proprietary library or driver used. The structure of classes designed for this software module makes it easy to re-use and adapt implemented algorithms and functions to incorporate and integrate</td>
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		new tests based on motion/video analysis, such as the Tinetti balance and gait tests.
Calibration	Mention, if there is a need to calibrate the motion detection component and if yes, describe the necessary steps.	For questionnaire module no calibration is needed. As for the computer vision module (currently solving the Get Up & Go test), the need for calibration is minimal: the camera is calibrated at the laboratory, before use at the hospital, and doesn't need to be calibrated again. So, NO calibration of the system is needed once in use at the hospital. The calibration technique in the laboratory is standard. We obtain intrinsic and extrinsic parameters of both (RGB and IR) cameras and perform both, independent and cross calibrations between cameras. The calibration will be performed by using a common calibration method by means of placing a printed checkerboard calibration pattern at different distances and orientations with respect the sensor.
On-site testing		
BARTHEL and MMSE Test BARTHEL: 2 tests à 15 min MMSE: 2 tests à 15 min	The proposed solution will be evaluated during the BARTHEL/ MMSE test based on its ability to interact with humans by speaking and natural language processing (even in case of slightly slurred speech) to limited extend, interpreting a set of standard pre-defined answers with multi-language support. An alternative mode of interaction like a touch screen tool may be considered to solve speech recognition issues. Describe possible explanations or Human-Robot Interactions here.	For Barthel and MMSE tests we are implementing 2 versions, one on the Kompaï robot and one on a standalone PC. These 2 implementations will be demonstrated but the idea is in the coming phases if we are selected to proceed with their benchmark by our partner APHP to decide which one will be used. These 2 versions uses voice for the interaction with the patient (fixed dictionary for voice recognition in this first phase) with the an alternative mode of interaction through a touch screen to solve voice recognition issues. Voice recognition from natural language will be implemented in the following phases. The 2 implementations uses English and Catalan but multi-language will be considered in the following phases too.
Get up and Go Test 3 tests à 20 min	The Get up and Go Test will be evaluated based on the proposed solution's ability to evaluate and record the patient's performance using standard components for motion analysis to the extent possible, to maintain sufficient visibility for the video and audio recording of patients during the tests and the platform's potential in terms of person following, face tracking, and other advanced features that will be implemented in the subsequent phases.	For this first phase we have only considered the Get-Up & Go test, described in the challenge description. To run the test we need a RGB-D camera, calibrated in the laboratory (tests have been performed with a Kinect v2 camera), and a fast computer (tests performed in the laboratory have been carried out with a i7-4790 3.6 Ghz x 8 computer using Ubuntu 14.04 64 bits). Specifications for the camera used: • RGB camera: 1920x1080 pixels at 30Hz with FOV 84.1x53.8 • Depth camera: 512x424 pixels at 30Hz using infrared laser technology with FOV of 70.6x60 The implementation of the mock-up system assumes the following hypothesis:

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<td>Describe possible explanations or Human-Robot Interactions here.</td>
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Only one person is performing the Get Up & Go test (so there is accompanying personnel)
No occlusions between the sensor and the observed person.
The main path of the person is parallel to the camera’s axis (this is due to the underlying 3D model in our approach. This is not a constraint per se, but a design decision for the mock-up, since in the next phases this can easily be generalized and the system work from any point of view).

Considering the camera’s field of view (FOV), the height from the floor once installed on the robot (1.06m), and the presented hypothesis, we need to put the camera (robot) parallel to the main path of the test at a distance of about 2.5 meters (assuming no tilt). If we need a shorter distance, the camera can be tilted -5º or -10º to reduce distance.
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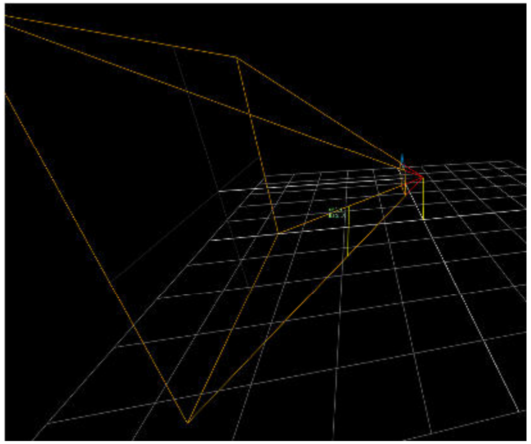

Figure 16:Camera field of view
</td>
<td>This image provides an idea of the camera’s field of view at 1.06m height and no tilt. Each square in the figure is 1x1m, the yellow line represents the intersection of the image with the floor. For this setup, we need to put the camera at 2.5m of the test (3m path parallel to the camera). If the camera is tilted down, this distance can be reduced.</td>
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With our current implementation, the sequence to perform the test is as follows:
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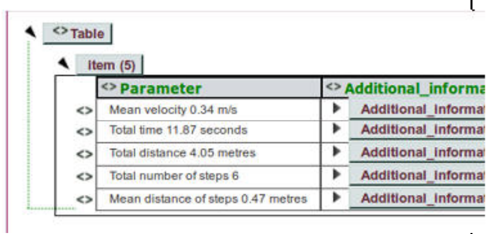
- Place the camera (robot) in the correct position.
- Learn the environment model. At this point, the person performing the test should not be seated on the chair. On our performed experiments this step takes something between 2 and 5 seconds, depending on the level of light and noise present in the gathered images.
- Ask the person performing the Get Up & Go test to sit on the chair.
- Start the process of person tracking, and ask the person to actually get up and perform the test as specified by the ABAT doctors (person gets up from the chair, walks 3m forward, stops, turns to come back, walks back to the chair, stops, turns and sits down again on the chair).
- Finish the process of person tracking.
- Get the results, including all of the listed parameters above (see motion tracking description section) as well as two videos of the test for comparison. In order to fulfill the requirements from the IT department of the ABAT Foundation (mail dated May 18th 2016), the output is provided in an OUT directory. Text results are provided coded into an XML file. The two videos are one classical RGB video and one video of the figure of the person where the patient can not be identified (data protection measures). Both videos are encoded using open-source implementation of media formats (so called video codecs) to avoid possible fees due to registered patents (we are currently using Xvid, but are not limited to this specific Codec and can provide other formats if needed).

Below, we show the results from two tests ran with two different persons, the first in our premises, and the second at the ABAT hospital in one of our visits assessing the usefulness of our approach for doctors using CGA.



Table

item (5)

Parameter	Additional_informa
Mean velocity 0.34 m/s	Additional_informa
Total time 11.87 seconds	Additional_informa
Total distance 4.05 metres	Additional_informa
Total number of steps 6	Additional_informa
Mean distance of steps 0.47 metres	Additional_informa

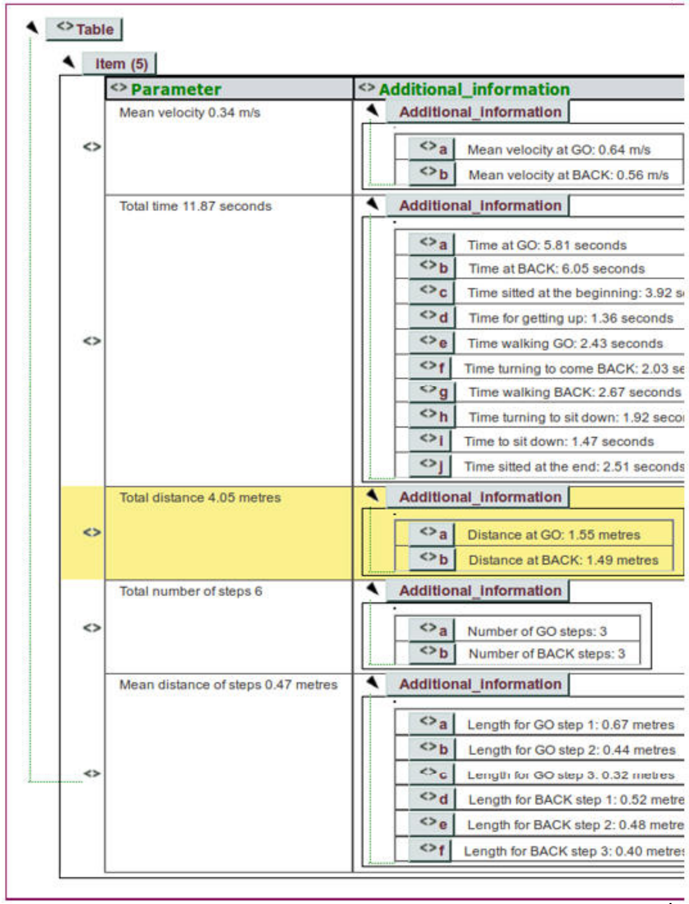
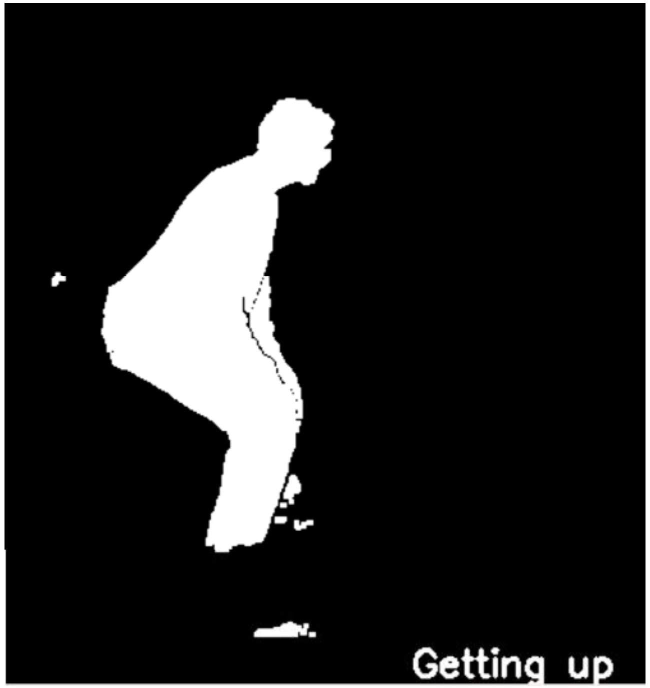


Figure 17:. On the left, an image of the XML output generated by the Get Up & Go test, one parsed, it contains the basic information. On the right, the extended information is provided. Both corresponds to a run performed at the INLOC office.

		Getting up	Walking	

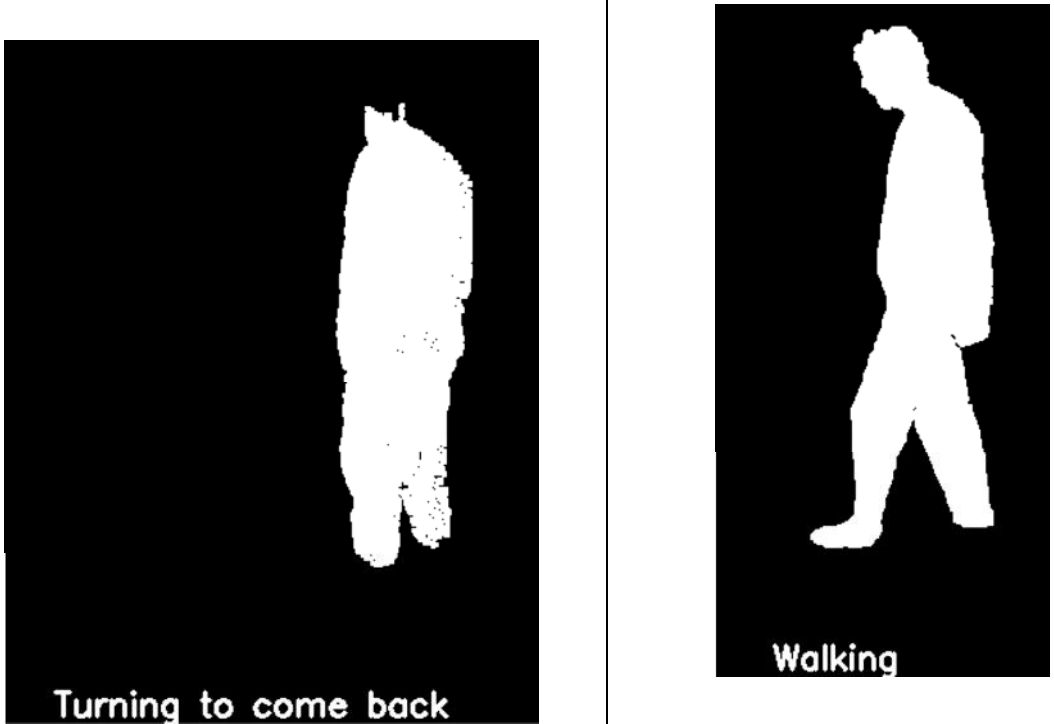


Figure 18:. Different moments of the Get Up & Go test performed at the INLOC office. Figures show the 'anonymous video' offered by the module with on-video information about the activity of the person as identified by our model. Note that we can write any text information (including total and/or partial figures of velocity, distance, etc.) for doctors on the video according to their needs.

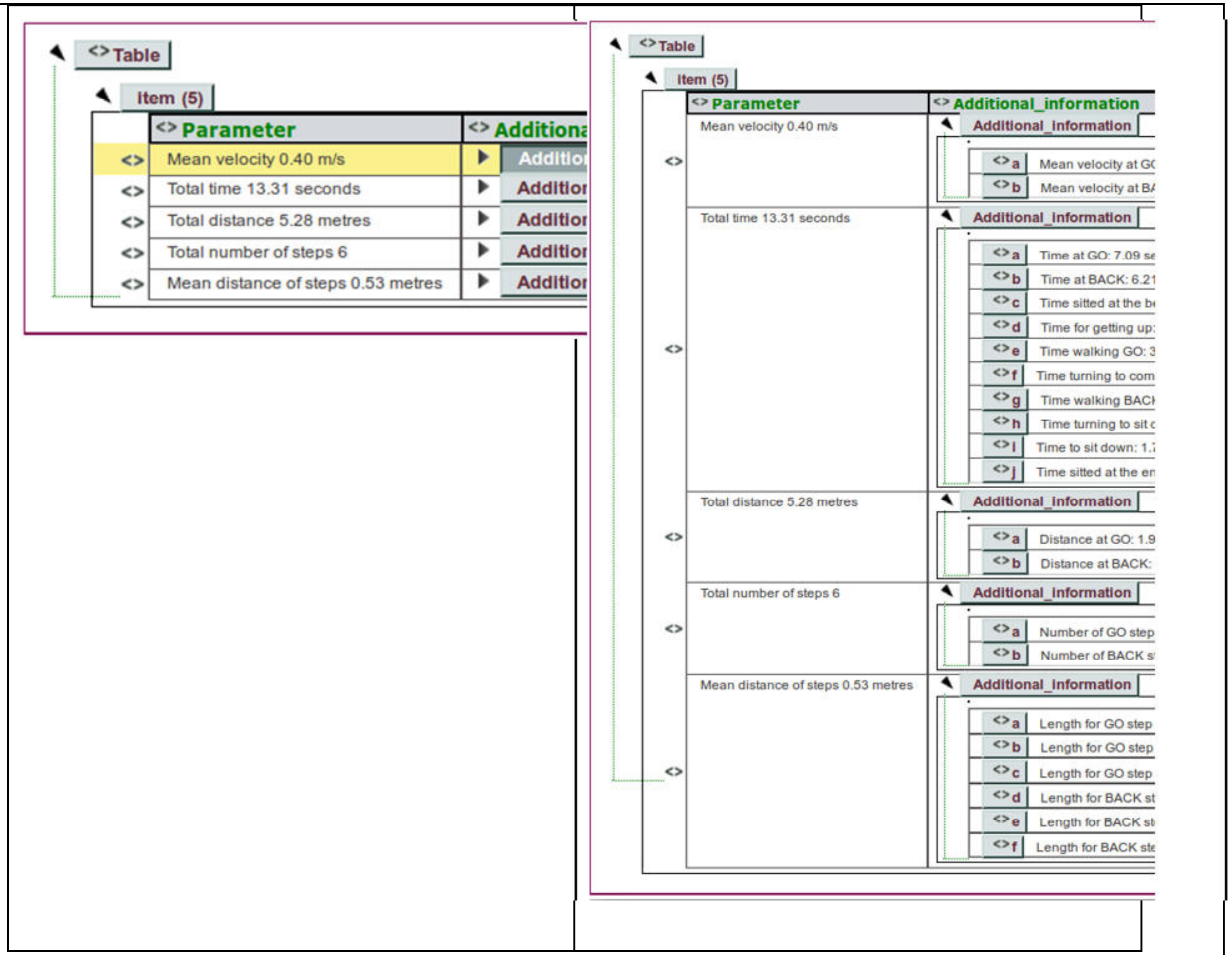


Figure 19:. On the left, an image of the XML output generated by the Get Up & Go test, the one parsed contains the basic information. On the right, the extended information is provided. Both correspond to a run performed on the ABAT premises during one of our visits to gather image data.

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		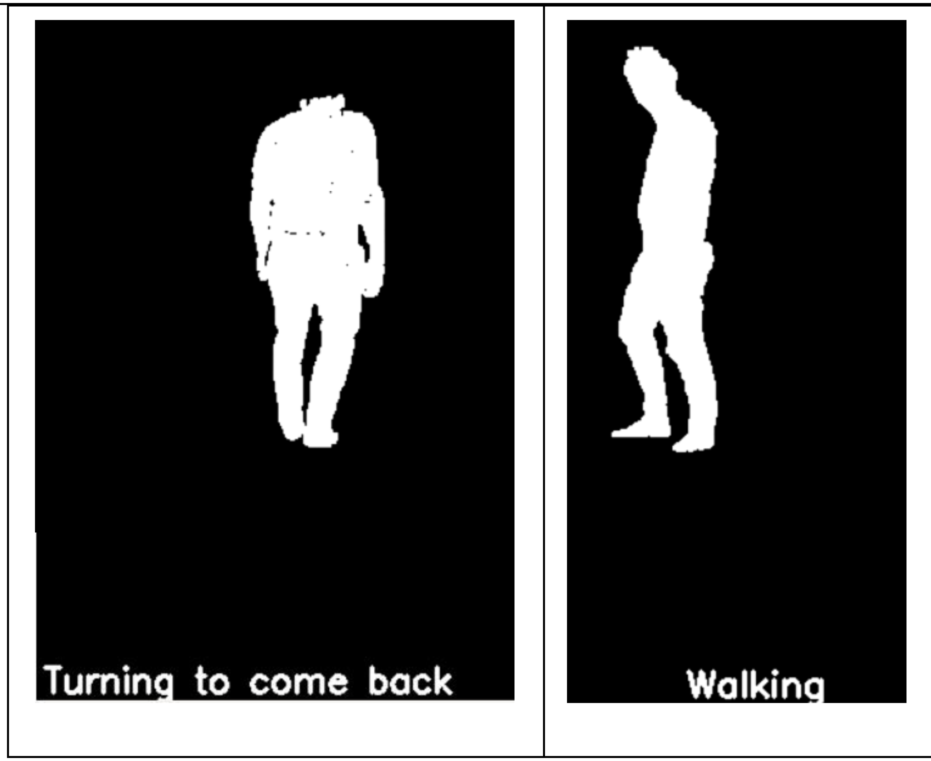 *Figure 20:*. Different moments of the Get Up & Go test on the ABAT premises.
Ethics	Please note that there are also ethical requirements to be described in a separate deliverable report.	
Economic Viability	Please note that you also need to include considerations concerning economic viability in a separate deliverable report.	