

## Proposal full title:

# Smart Robot House Cleaner

Proposal acronym:

SRHC

Type of funding scheme:

STREP

Work programme topics addressed:

Smart and healthy living at home

DT-TDS-01-2019

Participant number	Participant organization name	Participant name	Participant short name	Country
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# Proposal

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1. Scientific and/or technical quality, relevant to the topics addressed by the call

## 1.1 . Concept and objectives

The main idea of this proposal is to combine the following fields: robotics ( mechanical engineering, electrical engineering, computer science ), computer vision, intelligent sensors, internet technology, wireless; all that for the success of the next generation of robot house helpers.

The main idea that led us to propose this work was that people would have a lot more time to spend on activities that they like, instead of wasting time on doing monotonous chores like: vacuuming, wiping, cleaning windows, etc.

Objectives:

1. Cleaning: SRHC has to actually do it's job well, and not just be a gimmick. We will be measuring how much it has cleaned vs. how much there is to be cleaned.

Success criteria:

- Done the cleaning as well as an average person would.
  - Didn't miss important surfaces in need of cleaning.
1. Safety: SRHC should go through all the places in the house without breaking or damaging things that are not considered dirt. It should also be safe to use around pets like cats and dogs.

Success criteria:

- Finishing its cleaning route without breaking or damaging anything.
  - Not hurt anything that is in its way.
1. Self management: To lessen the amount of work a person has to do, SRHC should go back to the charging station when it's low on battery. Also, it should go back to the charging station when it finishes its job. When the garbage bag is full, it should dump its content into the designated trash can. When battery power is under 20%, SRHC should calculate distance to charging station, and check how much time it needs to come back, so it doesn't turn off before coming back. It also should do that when battery percentage is under 15 and 10 percent. If battery level is 5% or less SRHC doesn't clean anymore, but goes into safe mode and goes back to the charging station.

Success criteria:

- Coming back to charging station.
  - Calculating distance to charging station correctly.
  - Having time to come back to charging station before the battery runs out.
  - Finding out that garbage bag is full.
  - Going to the right place to empty its garbage bag, finding the trash can.
1. Initialization: The first time SRHC is activated in the room/house it should go through the place (going next to the walls, following right edges), and scan the position of all the objects in the room. After scanning the positions, it should be able to reconstruct the room, so it can go through it and clean it without breaking anything. For this purpose SRHC will use intelligent sensors, and also computer vision. Going through the room can be set manually, but also will be performed daily. Before the first cleaning of a day it will automatically start room scanning.

Success criteria:

- Being able to go through the room that should be cleaned.
- Being aware of the surroundings.
- Starting room scanning every day before first cleaning.

1. Programmability: SRHC should be programmable in some ways. User will be able to program it to start automatic cleaning every day at the same time. Before that initial cleaning, room scanning will be performed as described before. Also, user will be able to pick a day for emptying the garbage bag.

Success criteria:

- Recognized first cleaning of the day (after date change).
- Recognizing day of the week for emptying the garbage bag, and successfully emptying it.

1. Resistance: In order to last longer, SRHC will be made of steel. It will have some kind of armor so it cannot break if something falls on it.

Success criteria:

- Not broken if some house furniture, such as chair falls on it.

1. Cleaning hard to reach places: Our robot will be able to access hard to reach places such as corners of the walls and high shelves.

Success criteria:

- Cleared corners of the walls and other hard to reach spots.

## 1.2 Progress beyond the state-of-the art

The main company involved with this topic is iRobot with its production line of Roomba products. Roombas are shown to be practical, but since their launch, only incremental improvements have been made, and they still do essentially the same thing. Rombas have the following features:

- Maps your home to efficiently clean an entire level
- See where Roomba cleaned
- Cleans all floor types
- Cleans until the job is done.
- Control from your smart phone.

Some alternatives to Roomba include:

- Neato Botvac Series One of the biggest point of differences between Neato and Roomba is the navigation system. Neato use a laser sensor called the RPS, so before the Neato even starts it's first clean, it's scans the room and sets out a map of the perimeter to avoid obstacles.
- Samsung NaviBot Corner Clean The NaviBot maps out the home using its Visionary Mapping Plus system, the NaviBots camera takes a series of images of the ceilings in your home to build a visual map. The Samsung NaviBot has it's Auto Dust Emptying system – an add on dustbin that the NaviBot empties into, meaning it wont need to be as emptied nearly as much as it's Roomba competitor.
- Infinuvo Hovo Its biggest appeal is the price. Infinuvo, along with some other companies are just making more or less the same product as Roomba, but less polished, with competitive prices to lure in the more economical part of the market.

We have carried out a patent search, with the following patents being relevant: Autonomous floor-cleaning robot US 6883201 B2

Autonomous cleaning robot US 20130270459 A1

Autonomous surface cleaning robot for wet and dry cleaning US 8774966 B2

We want to expand beyond the current state-of-the art by using the already proven great features of robot cleaners, and adding more functionality. All these patents focus on cleaning the floor, but the logical follow up is to extend the possibilities so that it can also autonomously take care of other surfaces, like cleaning the corners of the walls, cleaning the windows, and other user designated surfaces such as tables and shelves. And that is exactly what our goal with the SRHC is.

## 1.3 S/T methodology and associated work plan

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First thing we want to do is to acquire information from the general public. We want to know what the people want - we have ideas of our own, but we want to please our customers as much as possible. We want to see their reactions to our ideas and hear their own. We plan on spending at least a week on this part.

Next, we will create a functioning prototype. It will have some basic functionalities like sensors used for moving around, vacuuming and so on. It will also have the ability to detect whether other surfaces, that the current version isn't capable of scanning, need to be cleaned. Another week should be more than enough for our team to finish this step.

During the creation of the prototype, we will be conducting thorough testing in order to find the flaws with our base operations, since if they aren't working properly - nothing is.

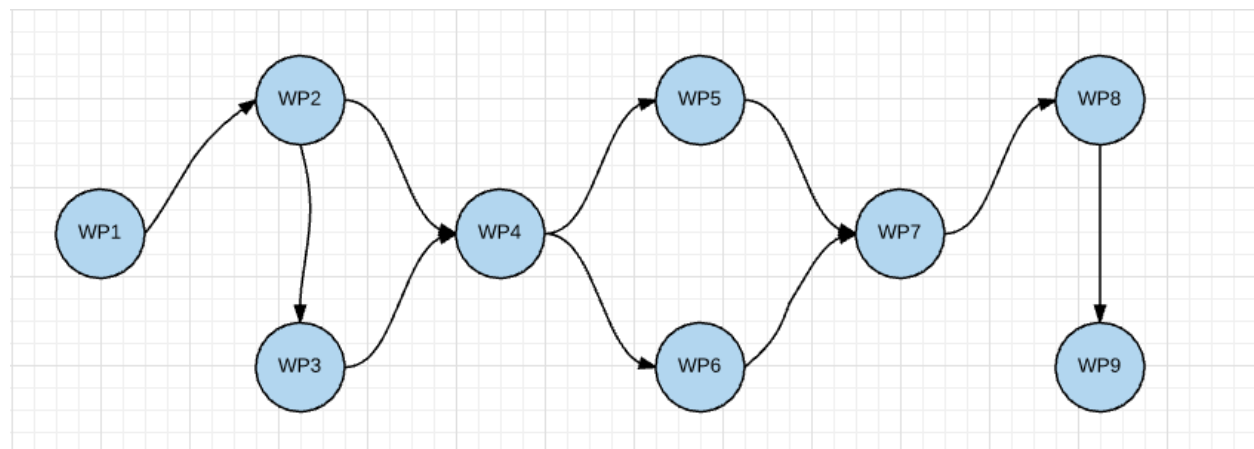
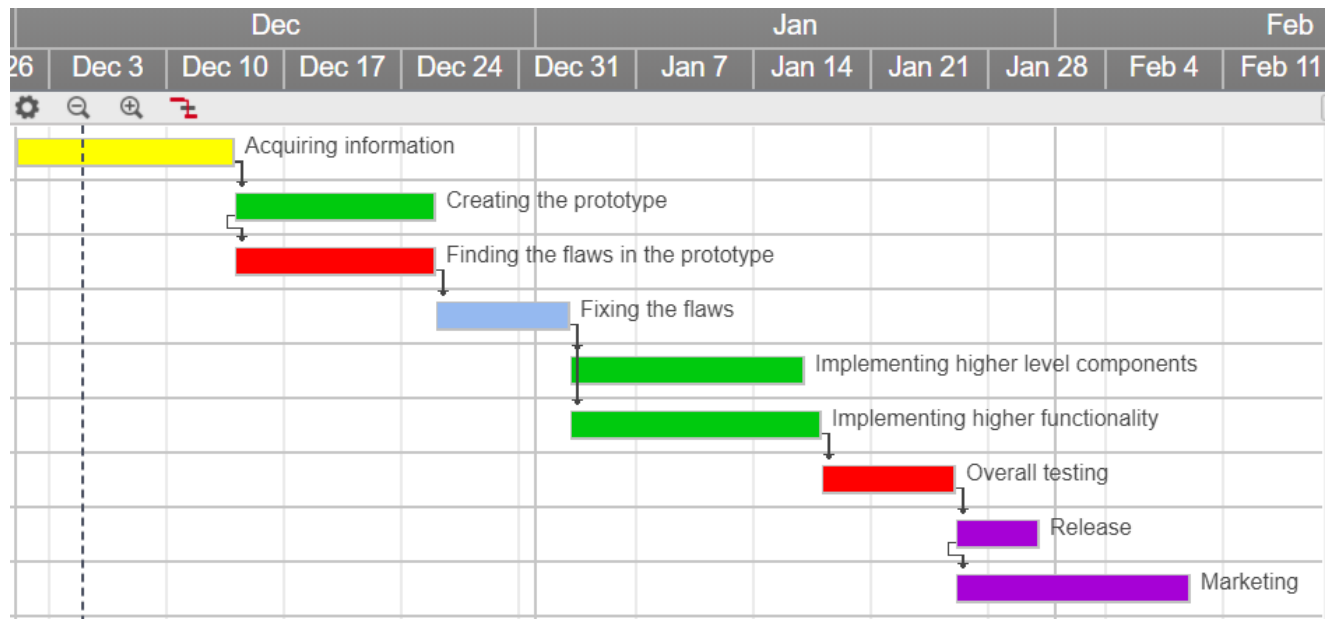
Of course, nothing is made perfect, so after the tests, we have to fix all the issues we found. The duration of this step may vary, due to the amount of issues found.

After we are certain our base operations are working well, we are going to add the higher level components. We are also going to improve the quality of existing components. We plan to spend around ten days on this bit.

At the same time, the programmers of our team are going to be implementing all the higher functionalities we, and the community, had in mind. After this step, we will have a finished product, that is an improved version of the existing one. Our team might be small but they are highly skilled - so ten days should be more than enough for them to implement everything.

Following the completion of the product, there is another set of thorough tests. We want to be sure that everything is working properly and that our product doesn't represent any danger to our consumers. We will take a week to conduct these tests.

We wrap everything up by releasing our product. This shouldn't take more than 3 days. The release is followed by dissemination - it will start immediately after the beginning of the release stage. Advanced marketing will take place the first few weeks after the release and after that, we will conduct regular marketing, mostly through ads on the internet, indefinitely.



## List of work packages

Work package no.	Work package title	Type of activity	Lead partic. no.	Lead partic. short name	Person-months	Start month	End month
1	Acquiring information	RTD	3	AB	0.2	1	1
2	Creating the prototype	DEM	2	SS	0.4	1	1
3	Finding the flaws	RTD	3	AB	0.4	1	1
4	Fixing the flaws	RTD	2	SS	0.4	1	1
5	Implementing components	RTD	2	SS	0.5	1	2
6	Implementing functionality	RTD	2	SS	0.5	1	2
7	Overall testing	DEM	3	AB	0.3	2	2
8	Release	DEM	1	ND	0.2	2	2
9	Marketing	DEM	1	ND	1	2	3

## List of deliverables

Del. no.	Deliverable name	WP no.	Nature	Dissemination level	Delivery date
1.1	Gathered information	1	R	RE	1
2.1	Prototype	2	P	PP	1
3.1	List of flaws/bugs	3	D	PP	1
4.1	Working base	4	P	PP	1
5.1	Prototype of improved quality	5	P	PP	2
6.1	Highly functional product	6	P	PP	2
7.1	Properly tested product	7	D	PP	2
8.1	Released product	8	D	PU	2



Milestones

Milestone number	Milestone name	Work packages involved	Expected date	Means of verification
1	Base functionalities working	1, 2, 3, 4	1	A prototype has been made and tested. All bugs were fixed.
2	Improved quality and functionality	5, 6, 7	2	The prototype has been improved with better materials and higher functionalities. It was also thoroughly tested.
3	Release	8, 9	2	The final product has been released and marketing has begun.

## Work package description

Work package number	1	Start date or starting event:	01.12.2017.				
Work package title	Acquiring information						
Activity type	RTD						
Participant number	1	3					
Participant short name	ND	AB					
Person-months per participant	0.1	0.1					

### Objectives

Interviewing potential customers, as well as people who already own a robot cleaner. Gathering their opinions on improving the existing robot cleaner or what they would like to see in our product.

### Description of work

Creating a detailed survey that will help gather the appropriate information.

Spreading the survey – either online or house-to-house.

Collecting the information and processing it.

ND and AB will work together in order to create the survey and process the information. AB will interview people face-to-face, while ND will take care of the online survey.

### Deliverables

Gathered information – this is the first deliverable of our project. It represents the information we've gathered from our potential customers. We plan to have it in a week – so in the first month of our project.

## Work package description

Work package number	2	Start date or starting event:		14.12.2017.			
Work package title	Creating the prototype						
Activity type	DEM						
Participant number	1	2	3				
Participant short name	ND	SS	AB				
Person-months per participant	0.1	0.2	0.1				

### Objectives

Creating a prototype which will possess all basic functionalities. This prototype will be able to scan the area, clean it and return to its charging station without any trouble. These are the functionalities essential to the SRHC, and they need to work properly.

### Description of work

Implementing sensors, that the SRHC is going to use in order to identify its surroundings.

Implementing the AI algorithms, that are going to help SRHC avoid obstacles.

Gathering the essential (possibly cheap, low quality) materials that the prototype is going to be built from.

Building the prototype and adding the software chip.

ND and SS will be working on the AI algorithms and sensors, considering the fact that those two tasks are tightly connected to each other. AB will be in charge of calculating the adequate parameters for the AI algorithms, as well as acquiring the needed materials. The team will work together in putting the SRHC prototype together.

### Deliverables (brief description) and month of delivery

Prototype – one of the most important deliverables of the early stages of our project. It will be further tested and, after fixing the issues that might arise, it will work as a base for the upgrades we and our customers have in mind. We want the prototype to be done in the first month of the project.

## Work package description

Work package number	3	Start date or starting event:		14.12.2017.			
Work package title	Finding the flaws						
Activity type	RTD						
Participant number	1	2	3				
Participant short name	ND	SS	AB				
Person-months per participant	0.1	0.1	0.2				

### Objectives

Finding all issues with the basic functionalities that could stall the development of higher level ones.

### Description of work

During the creation of the prototype, we will be thoroughly testing each phase. All issues are going to be tracked and labelled for fixing in the following steps.

AB will have the lead here, conducting the tests and labelling the issues. She will cooperate with ND and SS, letting them know if there are any major flaws that need to be fixed urgently or just gathering information from them about the implementations.

### Deliverables (brief description) and month of delivery

List of flaws/bugs – after the testing, we will have a list of all bugs that appeared during the tests. It will be properly organized, each bug will have its priority level and an assignee that will be fixing it.

## Work package description

Work package number	4	Start date or starting event:		26.12.2017.			
Work package title	Fixing the flaws						
Activity type	RTD						
Participant number	1	2	3				
Participant short name	ND	SS	AB				
Person-months per participant	0.1	0.2	0.1				

### Objectives

Fixing the flaws found in the previous step so the production could proceed.

### Description of work

ND and SS will be working on improving the algorithms they implemented, that caused the bugs. AB will be working on fixing parameters that were potentially off. Also, AB will conduct final testing in order for work to proceed.

### Deliverables

Working base –we will have a base model that will be fully functional. All the basic functionalities will have been implemented and tested at this point. The base model will further be improved by higher quality materials and functionalities. This is the deliverable we expect to be the last of the first month.

## Work package description

Work package number	5	Start date or starting event:		03.01.2018.			
Work package title	Implementing components						
Activity type	RTD						
Participant number	1	2	3				
Participant short name	ND	SS	AB				
Person-months per participant	0.1	0.3	0.1				

### Objectives

Implementing the higher quality components, so the SRHC doesn't break easily, doesn't overheat, processes information it gathers faster and so on.

### Description of work

Acquiring high quality components.

Putting them to work.

SS will be in charge of this phase. He will do most of the work, with ND supporting him along the way. AB will do the research in order to find the best components for the SRHC.

### Deliverables

Prototype of improved quality – we will get a prototype with high quality components, that will allow it to work more efficiently. We expect to get this prototype in the second month of our project.

## Work package description

Work package number	6	Start date or starting event:		03.01.2018.			
Work package title	Implementing functionality						
Activity type	RTD						
Participant number	1	2	3				
Participant short name	ND	SS	AB				
Person-months per participant	0.1	0.3	0.1				

### Objectives

Implementing higher functionalities that will allow the SRHC to access some hard-to-reach areas (like corners), recognize that its garbage bag is full and empty it, realize its battery is running low and return to the charging station in time and so on.

### Description of work

SS will be in charge of this part, cooperating with ND in advance algorithm implementation. Considering the fact there will be AI algorithms implemented, AB will work on finding the most fitting parameters for them.

### Deliverables

Highly functional product – this phase leaves us with a product of high functionality, able to do all the things we and our customers intended for it to do. We expect it in month 2 of our project.

## Work package description

Work package number	7	Start date or starting event:	18.01.2018.				
Work package title	Overall testing						
Activity type	DEM						
Participant number	1	3					
Participant short name	ND	AB					
Person-months per participant	0.1	0.2					

### Objectives

Testing the (final) product we got in the last step, making sure that everything works as planned.

### Description of work (possibly broken down into tasks) and role of partners

AB will be in charge of creating and conducting the tests, with ND assisting her in the process. The information gathered from the tests will then be processed by AB and ND will do the necessary fixes.

### Deliverables

Properly tested product – final version of the product, thoroughly tested and with all bugs fixed. The version that will be released to public in the next step. We expect it by the end of month 2.



## Work package description

Work package number	8	Start date or starting event:	26.01.2017.				
Work package title	Release						
Activity type	DEM						
Participant number	1	2					
Participant short name	ND	SS					
Person-months per participant	0.1	0.1					

### Objectives

Releasing the finished product, making it available to public for purchase.

### Description of work

ND will make deals with tech companies that will be selling our product.

SS will help ND in answering technical questions that might arise.

### Deliverables

Released product – fully functional, fully tested product that is released to public and is up for sale. We expect it by the very end of month 2.

## Work package description

Work package number	9	Start date or starting event:			26.01.2018.		
Work package title	Marketing						
Activity type	DEM						
Participant number	1	2	3				
Participant short name	ND	SS	AB				
Person-months per participant	0.6	0.1	0.3				

### Objectives

Conduct dissemination – spread word of SRHC and all things it can do.

### Description of work

ND will be in charge of this part, developing marketing techniques, creating advertisements together with AB and spreading them around. While SS will work as a ‘customer service’ for a few weeks after the release, answering all technical questions.

### Deliverables

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Summary of effort

Partic. no.	Partic. short name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	Total person month
1	ND	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<b>0.1</b>	<b>0.6</b>	1.3
2	SS	0	<b>0.2</b>	0.1	<b>0.2</b>	<b>0.3</b>	<b>0.3</b>	0	0.1	0.1	1.4
3	AB	<b>0.1</b>	0.1	<b>0.2</b>	0.1	0.1	0.1	<b>0.2</b>	0	0.3	1.2
Total		0.2	0.4	0.4	0.4	0.5	0.5	0.3	0.2	1	5.1

# Implementation

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## 2.1 Management structure and procedures

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Describe the organizational structure and decision-making mechanisms of the project. Show how they are matched to the complexity and scale of the project.

We are planning to have a equal organization of responsibilities and work. Every project team member will have their own obligations and assignments. The plan of the implementation is to have one coordinator (project manager) who will assign responsibilities and obligations, and also one coordinator for technological solutions (S&T manager). Having a main coordinator will ensure that the project progress is supervised, which will reduce probability of failure or exceeding deadlines.

Precise milestones and delivery dates as well as the content of the deliverables are defined in a detailed project plan. Project control will be established, supported by communications tools and a central communications platform. There will be visible assignments, bugs, fixes, etc. Also, project team will have face to face meetings. The main communication channels will be e-mails, phone and mentioned meetings.

Team manager responsibilities:

- co-ordination of the project
- risk analysis
- negotiations and daily meetings with clients
- scheduling the project team meetings
- maintenance the project plan

S&T manager responsibilities:

- scientific and technological planning
- recognizing appropriate technologies
- recognizing appropriate technological solutions
- having a constant knowledge of Progress
- being in touch with the project team by phone, e-mail or through face to face meetings
- present overall monthly progress to team manager

Work package leader responsibilities:

- organizing a meeting on specific work package when needed (required by team manager or S&T manager)
- present weekly progress to S&T manager
- present monthly progress to S&T manager
- give the oral presentations at review meetings
- propose the methodology to be used for the work on work package

All project team members responsibilities:

- following the development plan
- following the determined rules
- present weekly progress (for their part of development)
- present monthly progress (for their part of development)
- being kind and friendly to other team members

Continuous project evaluation will take place to verify the quality of the deliverables, working documents and research results, measured against the project vision, objectives and quality requirements of the European Commission.

## 2.2 Individual participants

### SS, Belgrade, Serbia

SS is a master student at Faculty of mathematics, University of Belgrade. His main subjects are based on computer science. He is very experienced in the field of mathematics as he was competing in primary and high school. He also passed a lot of mathematical subjects during his time at Faculty of Mathematics. For this project it is very important that every member has a good mathematical base. This is the reason his mathematical knowledge is important. His main tasks won't be connected to mathematics as we have other member whose primary field of knowledge is mathematics (AB). Primary field of knowledge of this member is computer science, specialized in mobile applications and low level programming of embedded systems. His main tasks will be connected to android / IOS applications that have connection with SRHC. He will also be in charge of programming the robot. His main area is low level embedded systems programming, but he will also use the help of our other member ND for different geometric algorithms. ND is specialized in that area.

His responsibilities will be:

- developing android applications connected to SRHC
- developing IOS applications connected to SRHC
- supervising android applications development
- supervising IOS applications development
- developing software for our robot
- supervising software development for robot
- all responsibilities as a S&T manager mentioned in 2.1 part Management structure and procedures

SS experience in areas related to technologies we plan to use:

- different android applications
- different IOS applications
- development of robotic hand that can find and press a button
- development of robot that can carry a glass from one point to another

### ND, Belgrade, Serbia

ND is a graduate student at Faculty of Mathematics, University of Belgrade, on his way to the Master's degree. He is interested and experienced with algorithms, data structures, and game development, of which the first two will be important for developing the key components, and the last one to combine them into a functioning whole.

His responsibilities will be:

- developing optimal and efficient routing and mapping algorithms for SRHC
- developing visualizations of the work done by SRHC
- developing decision making components based on sensor input
- responsible for code review and management
- all responsibilities as a Team manager mentioned in 2.1 part Management structure and procedures

ND experience in areas related to technologies we plan to use:

- android applications
- Unity Engine visualizations
- computer vision with SimpleCV

### AB, Belgrade, Serbia

AB is a student at Faculty of Mathematics, University of Belgrade, currently attending Master degree studies. She is interested in mathematical optimization, which will help make SRHC faster and better, as well as in software testing, which will be important for making sure everything runs smoothly and the final product satisfies customers' needs. Her strong mathematical skills will be of great asset in the work she will be doing.

Her responsibilities will be:

- optimizing AI algorithms for SRHC
- testing prototypes and the final product
- improving the quality of SRHC's structural elements

AB experience in areas related to technologies we plan to use:

- mathematical optimization
- white and black box testing
- artificial intelligence algorithms and parameter tuning

## 2.3 Consortium as a whole

While the three participants all come from the same educational background, they differ in experiences and interests in various fields.

The members of the consortium know each other well, they are passionate about their idea, and will work hard to achieve set objectives.

AB has the upper hand when it comes to the more theoretical mathematical concepts which are needed for parts of the algorithms concerned with mapping out the house model. AB also has experience with gathering information surrounding the problem, testing, and databases. AB will be the work package leader.

ND is fond of design of algorithms which will be efficient and optimal for the problem at hand, and knowledge of geometric algorithms will be important for functionality of the SRHC. Those algorithms will communicate with the API to the hardware of the SRHC. ND Will be the team manager.

SS will create the said API, and with his experience in mobile development will be the main developer of the Android / iOS applications connected to the SRHC. SS will be S&T manager.



## 2.4 Resources to be committed

A lot of different resources will be needed for completing SRHC project. It is very large and complex project, and beside a lot of time we have to spend we also need resources. This project needs different kind of resources.

Project manager has spoken to some companies and made some agreements.

Enevo - Finland company found 2010. Their primary field of production are intelligent sensors. We made an agreement with them. Enevo will make all relevant sensors for SRHC project. Smart robot house cleaner needs sensors for detecting movement (cats for example), detecting static objects etc. All kind of sensors will be provided by Enevo.

Very important components of the SRHC will be microchips. ND made an excellent agreement with company that makes different kinds of microchips our robot needs to be functional. Company country is Belgium, and company name is NewFusion.

Our robot also need processor for calculations and computing. Project manager made an agreement with Intel company. They are willing to make some specific processors SRHC will need. It's not standard processor. Some of the operations have to be much faster to the detriment of some others.

Hardware parts and elements are probably crucial. We need to make functional parts made of steel as we noted before. There will be a lot of different parts, wheels, levers etc.

Expert in integration of microchips and intelligent sensors with hardware parts of the SRHC is very important.

Our costs will cover:

- intelligent sensors made by Enevo
- NewFusion's microchips
- specific Intel processors (we probably will need more than one processors, because of prototypes  
and some for testing purposes)

- expert in earlier mentioned integration
- hardware parts prices

Project is based on geometric and AI algorithms so we need very good hardware support. We need powerful computers with good CPUs. Our costs will also cover prices for those computers.

## Section 3. Impact

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### 3.1 Expected impact listed in the work programme

People automated so many aspects of their lives, but still every home needs regular vacuuming, cleaning, and dusting. All those things take time and energy, and why should we spend those valuable resources on things we dislike doing?

With our idea, said chores aren't such waste of human productivity. People will have more time to relax, think about other things, or do more work where it counts, and the SRHC will do the chores for them. With that offload on responsibilities, we expect people to feel more relaxed knowing that they'll have a clean house without so much involvement.

By regularly cleaning, it reduces the amount of dirt and dust in the house, expecting increased health of people living in that household, especially if one is allergic to dust. Also, elderly people will benefit because they don't need to take action and hurt themselves in the process. Furthermore, physically impaired people will benefit even more, for the obvious reasons.

We expect the general population to adopt the SRHC instead of more traditional cleaning techniques, and that it will inspire people to create more automated house helping robots, and increase the demand for them.

## 3.2 Dissemination and/or exploitation of project results, and management of intellectual property

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Dissemination will be external. We will use different kinds of dissemination channels:

- web site of the project
  - other web sites
- school presentations
  - commercials
  - TV
  - radio
  - facebook page of the project
  - flyers
  - billboards

Existence of the web site is very important for any project, also for ours. On the web site you can find some demo videos (how SRHC works), prices, representative offices. Users will also be able to see components of SRHC, like smart sensors, microchips etc. We will provide links to their web sites. On their web sites will also be links to our web site and our robot.

School children are very futuristic orientated. Our idea is to exploit that. By school presentations children will be notified about our project and they will go homes and talk to their parents about amazing robot they heard about at school.

Different kinds of commercials (TV, radio) are one of the major ways to let people know what you sell. SRHC will be advertised a lot. We want to invest in commercials as we understand importance of them.

Almost everyone nowadays are on facebook. Good way of letting people know about your project is facebook. There will be SRHC facebook page where facebook users will be able to find all relevant information about our robot. There also will be pictures of it, videos too. Pictures and videos will show different kinds of cleaning our robot provides.

Billboards and will be set all over the cities and flyers will be distributed by our employees in different parts of cities.

The project will take part in different workshops, summer schools, seminars, conferences. Project has a lot of potential, and is very open for cooperation with other similar projects. There will be presentations and demos at large public events like technology fairs. There will be talk about sensors, computer vision, and also our ideas and how we managed to fulfill project goals.

We are planning to make a patent of this project. We want to protect our intellectual property. This project has some improvements in comparison to some other similar projects as described before. We will make new patent of it because we want to save our intellectual property. We will consult European Patent Convention (EPC) and Patent Cooperation Treaty (PCT) for making patent out of project.

## Section 4. Ethical Issues

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The proposed project does not directly involve any ethical, legal, social issues.

Minor safety issues may arise if the SRHC makes an object fall whilst cleaning a surface that is above the floor. To prevent those issues, safety measures will be implemented to prevent dangerous outcomes in the form of sensors and SRHC's decision making. Decision making will always take into account what could go wrong, and in that case will skip any actions that may have an unwanted result.

Special care will be stressed on the environmental issues. We will deal with special care when working with batteries, recycle materials, and focus on reducing the energy consumption of the SRHC.

## Ethical Issues Table

	YES/NO	PAGE
<i>Informed Consent</i>		
Does the proposal involve children?	NO	
Does the proposal involve patients or persons not able to give consent?	NO	
Does the proposal involve adult healthy volunteers?	NO	
Does the proposal involve Human Genetic Material?	NO	
Does the proposal involve Human biological samples?	NO	
Does the proposal involve Human data collection?	YES	
Research on Human embryo/foetus		
Does the proposal involve Human Embryos?	NO	
Does the proposal involve Human Foetal Tissue / Cells?	NO	
Does the proposal involve Human Embryonic Stem Cells?	NO	
<i>Privacy</i>		
Does the proposal involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)	NO	
Does the proposal involve tracking the location or observation of people?	NO	
Research on Animals		
Does the proposal involve research on animals?	NO	
Are those animals transgenic small laboratory animals?	NO	
Are those animals transgenic farm animals?	NO	
Are those animals cloned farm animals?	NO	
Are those animals non-human primates?	NO	
<i>Research Involving Developing Countries</i>		
Use of local resources (genetic, animal, plant etc)	NO	
Impact on local community	NO	
<i>Dual Use</i>		
Research having direct military application	NO	
Research having the potential for terrorist abuse	NO	
<i>ICT Implants</i>		
Does the proposal involve clinical trials of ICT implants?	NO	
<b>I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL</b>	YES	

