

# ARound Me

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## PURPOSE

The Software Requirements Specification (SRS) is intended for the developers of the software product "ARoundMe".

The document provides a well detailed guidelines for the development of the proposal, including the product descriptions, requirements, technology, etc.

## PRODUCT SCOPE

This product is designed to solve the problem of social inclusion of people with disabilities. More specifically, this product will help people with disabilities who are learning a specific trade by giving them precise instructions on how to use a required tool (workshops in a occupational centers). By doing this, our target group will be able to solve common tasks at their workplace, without the help of their overseer which in turn will increase their self-esteem. This will be achieved as a mobile app based on Augmented Reality (AR).

## DESCRIPTION

### USER NEEDS

The product is designed for smart phones that use Android as operating system. Also, the mobile phone should be equipped with a working camera.

There three main types of Users for the App:

- person with memory difficulties,
- online helper,
- person that adds new tutorial on how to use tool.

### OPERATING ENVIRONMENT

The product is a mobile application (phone and tablet) using Android operating systems.

### PRODUCT FUNCTIONS

To better understand the needs of people with disabilities, we checked the web and searched what are the struggles of people with disabilities when using mobile apps. Since there are many different disabilities, there are also multiple ways to improve the experience of these people.

So, to improve their experience, the app will have:

- Configurable button and background colors (there will also be colorblind mode),
- Configurable font sizes,
- Adjustable sound,
- As little as possible amount of text.

With these perks, the user can adjust the UI and make their experience enjoyable.

# REQUIREMENTS

## FUNCTIONAL REQUIREMENTS

When the user opens the app, they will be brought to main menu page. From main menu page, they can navigate to other four pages.

- First page opens up a camera. From this page, user can scan certain tools, and by doing so, they get additional info about the tool (such as where the tool can be used), along with a video tutorial on how to use it.

- In the second page, user can add a tool to the Tool Bank or access and modify the tools that are currently in the Tool Bank. The Tool Bank contains several categories, such as workshop tools, kitchen tools, drawing tools, etc. The user can navigate through these categories depending on what kind of work they are doing. It is also possible that the user adds their own category in which they can later add more tools. Once a person is in the Tool Bank, they can select a category and view all the tools in it. Each item here has a name, list of actions, an image and a QR code specific to the tool. The user can add new tools to the category and also edit the properties of the existing tool (name, info, etc.). They can also add new functionalities or modify old functionalities to the tool and attach multiple types of media to it, specifically textual description, images, a video and/or audio tutorial.

- In the third page, the user can establish a video call with an Online Assistant if the previous two pages did not help. Shortly, the Online Assistant will answer the user and help them with their problem. The person will have an option to turn on/off their microphone and their camera. Once the problem is resolved, they can end the call.

- Finally, the user can open the info page which will inform them about the project.

The user can also access Settings page where they can modify many components of the app. They can change colors of the app, modify the sound volume, change the font size and turn on text to speech.

## NON-FUNCTIONAL REQUIREMENTS

### PERFORMANCE REQUIREMENTS

- The app should be able to handle 100 thousand users without having performance issues.

- There should be a database (around 100 GB) where all the video tutorials will be stored. The size should increase if needed.

- It is necessary for the mobile device to have Android OS and that it is equipped with a camera and a speaker for text to speech conversion.

- The device should be connected to the internet so it can access the video tutorials.

### SAFETY REQUIREMENTS

The app must inform the person with functional diversity at all times about the correct use of the tools and that in case of any doubt, immediately consult their supervisor, teacher, etc.

### SECURITY REQUIREMENTS

- The app should not store personal data.

- No authentication is required in order to use the product.

## ACCESSIBILITY FEATURES

- Big screen elements and changeable font size – for people with vision issues

- Adjustable color schemes and colorblind mode – for colorblind people

- Text to speech conversion – for people with hearing issues

# TECHNOLOGY

## EMERGING TECHNOLOGY

The technology used in this application is Augmented Reality. The way it is used in the app is the person can scan the tool they are having troubles using and the app shows them how to use it. It does so by showing a video tutorial on how to use the tool. Another option to view the tutorial is using AR, which puts the 3D model of scanned tool on the device screen and displays the tool's uses through animation. Another useful technology which will can be used is AI, specifically neural networks. As it is stated above, the person needs to scan the object in order for tutorial to be displayed. Therefore, it is very important that the app recognizes the tool correctly and fast to ensure user satisfaction. In case the scanning tool does not work as expected, there will also images of tools in Tool Bank where the user can just select the tool they need help with and the tutorial will start.

## DEVELOPMENT TECHNOLOGY

This app will be developed using Unity Development Platform. Unity is a platform made for developing multi-platform video games and applications, and one of the platforms is Android, the OS this application will run on. Another reason to use Unity is that some very good libraries that implement AR are written for it.

One of the libraries is Vuforia. Aside from being great AR library, Vuforia also has an option to easily incorporate computer vision to any app, which is great for scanning the tools. Because Vuforia is both an AR library and also includes computer vision, it will make the problem much simpler.

Finally, programming language that will be used is C#, simply because it is the default programming language for Unity.



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# Gibalica



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## PURPOSE

The SRS is intended for the developers of the software product Gibalica. The document provides guidelines for the development of the product Gibalica, including the product description, requirements and technology.

## PRODUCT SCOPE

This product is intended to be used as a virtual fitness trainer. It aims to encourage physical activities of all people. A special attention should be placed on accessibility features (e.g. speech-to-text, text-to-speech, alternative forms of presenting the content) so that people with different disabilities can use it. Such a product should be designed according to the “design for all” principles (<http://designforall.org/design.php>).

## DESCRIPTION

### USER NEEDS

Targeted users are people who would like to:

- engage in basic physical activities such as “raising both hands up”,
- improve the left-right orientation,
- have fun playing games such as <http://www.pjesmicezadjecu.com/dobre-stare-igre/dan-noc.html> (e.g. the user should squat when the app plays „sit down“, and the user should remain standing when it says „stand up“).

### PRODUCT FUNCTIONS

The main feature of the app revolves around the detection of the user and its pose (e.g. placement of head, hands, legs, torso...) using the live feed from the device’s camera as an input. The mobile device would be placed on a stationary object such as table and its camera (i.e., front-facing, selfie camera) would face the user from head to toes.

Such a feature is then used in several modes available from the main menu.

The application offers the following modes:

- learn mode – the user needs to replicate the “pose” instructed by the app. For example, the app may ask the user to “raise a left hand up” and the user should raise a left hand,
- challenge mode,

### OPERATING ENVIRONMENT

The product is a mobile application (phone and tablet) which supports at least one of the two major mobile operating systems (Android and/or iOS). Alternatively, the product can be developed as a PC application, following the described guidelines.

- free mode – the user makes a pose and the app informs (visually and audibly) about the detected pose,
- training mode – the user can do workouts such as “10 squats”, “left-right orientation”, “choreography” (concept similar to: [https://en.wikipedia.org/wiki/Simon\\_\(game\)#Gameplay](https://en.wikipedia.org/wiki/Simon_(game)#Gameplay)),
- game mode – e.g. the user should squat if the app prompts “night” and should stand when it prompts “day”.

## REQUIREMENTS

### FUNCTIONAL REQUIREMENTS

The application should have five modes available from the main menu: learn mode, challenge mode, free mode, training mode and game mode (described in 2.2). The modes should be accessible through the press of the corresponding UI button.

Each mode (except the free mode) should follow the following flow:

1. user onboarding – the app should instruct the user what to do before the activity starts:
  - a. find a location on a still surface where the device can be,
  - b. place the device on a still surface such as table and point the screen towards you
  - c. make sure the front-facing camera can see you fully from head to toe.

The app should then prompt the user if he is ready to go (e.g. when the user makes the “T-pose” - <https://knowyourmeme.com/memes/t-pose>);

2. main activity – consists of series of tasks. E.g. in “learn mode”, the app should prompt the user to make a pose “left hand up”. When the left hand is raised, the app may reward the user with points, sound cues or something and then the next task;
3. follow up – the screen which will present the user with the outcome of the activity (e.g. statistics, rewards) and offer navigation (e.g. restart or return to main menu).

Note: The free mode does not include “follow up”.

The application should have a settings activity where the user can tweak the UI and other options according to his/hers liking. Available options should include:

- language selection,
- turning the voice commands on/off,
- turning the contrast mode on/off,
- increasing/decreasing font size.

### NON-FUNCTIONAL REQUIREMENTS

#### PERFORMANCE REQUIREMENTS

The application should ensure that the pose estimation happens in near real-time (no longer than 2 seconds should be spent on estimating the users pose).

#### SAFETY REQUIREMENTS

The application should inform the user to be mindful of their surroundings while performing the actions and poses required by the application.

#### SECURITY REQUIREMENTS

The product should not store personal data. No authentication is required in order to use the product.

#### OTHER NON-FUNCTIONAL REQUIREMENTS

The graphic design should be simplistic and engaging. The user should feel like he/she always interacts with an animated character (female, as per the app’s name). UI interaction should focus on two key modalities:

- simple UI on-screen buttons,
- voice commands.

## ACCESSIBILITY FEATURES

The application must ensure an option for voice command navigation. The application should also offer different forms of the content representation such as animation, image, or audio. The graphic design should be simplistic with simple UI on-screen buttons. The application must offer several accessibility options on its settings screen: turning the voice commands on/off, turning the contrast mode on/off, increasing/decreasing font size.

## TECHNOLOGY

### EMERGING TECHNOLOGY

The product heavily relies on the application of machine learning technologies, more specifically computer vision techniques which are used for pose estimation.

### DEVELOPMENT TECHNOLOGY

The recommended technology stack for the Android solution includes:

- Figma, Adobe XD, or Invision – for developing a prototype,
- Android SDK – for app development,
- ML Kit Pose Detection API for implementing pose detection (<https://developers.google.com/ml-kit/vision/pose-detection>),
- Speech recognizer API for implementing voice commands (<https://developer.android.com/reference/android/speech/SpeechRecognizer>),
- Text-to-speech API for implementing audio prompts (<https://developer.android.com/reference/android/speech/tts/TextToSpeech>) – alternatively, pre-recorded sounds may be used,
- Adobe Character Animator CC for implementing the „Gibalica“ character (<https://www.youtube.com/watch?v=bWtk9A6ZoL8>).



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# HoloGeometry

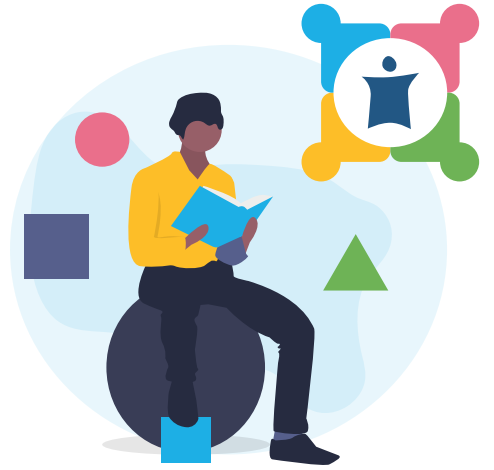
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## PURPOSE

The SRS is intended for the developers of the software product HoloGeometry. The document provides guidelines for the development of this product, including the product description, requirements, and technology.

## PRODUCT SCOPE

This product is intended to be used as a tool to help students learn geometric objects using approach based on Ostensive Phenomenon. This phenomenon arises from the fact that most geometric bodies in textbooks are drawn from a single perspective, which means that students are not able to apply the knowledge they have learned when those geometric bodies are in a different spatial orientation. This application needs to provide visualization of geometric bodies in space with the possibility of interaction through the use of holography technology, which helps in the visualization of 3D objects. Special attention should be paid to accessibility features so that people with various disabilities (e.g., people with Down syndrome) can use this program. Such a product should be designed according to the "Design for all" principles (<http://designforall.org/design.php>).

## DESCRIPTION

### USER NEEDS

The product solves the challenge of learning three-dimensional geometric shapes. The abstract ideas that geometry conveys from direct experience make the world more understandable to everyone, including people with Down syndrome. The target user is anyone who likes math and wants to learn basic geometry in a visual way, using mobile application and 3D visualization technologies.

### OPERATING ENVIRONMENT

The product is a mobile application (phone and tablet) that supports at least one of the two major mobile operating systems (Android and/or iOS). Alternatively, the product may be developed as a PC application, following the guidelines described. The holographic technology used for this application is called pyramid holograms. A Windows operating system or a mobile device running Android or iOS is required to launch the holographic portion of the application.



## PRODUCT FUNCTIONS

The main feature of the application revolves around displaying geometric shapes in the 3D form of a hologram and creating a user interface that allows the user to interact with the displayed objects in the 3D environment through hand gestures.

The application should have three functions in the form of three games accessible from the main screen:

1. Learn geometric shapes - the user selects a geometric shape and the application projects the shape onto the hologram while information about the shape is displayed on the screen.
2. Recognise geometric shapes - the application should project a random geometric shape onto the hologram and allow the user to select one of three suggested geometric shapes (two incorrect shapes are randomly selected from a pool of shapes).
3. Test your knowledge - the application should launch a quiz with simple questions about a randomly selected geometric shape and the user should answer the questions. The user should receive points for correct answers.

The user should be able to change the colour of the geometric shapes and their size.

With the points he or she gets for correct answers in the test, the user can open rewards in the form of avatars and different patterns that he or she can apply to geometric shapes in the application.

## REQUIREMENTS

### FUNCTIONAL REQUIREMENTS

The application should have the following 3 options: (i) Learn geometric shapes, (ii) Recognize geometric shapes, and (iii) Test your knowledge.

In (i) "Learn geometric shapes", the user should be able to select a geometric shape from a set of defined geometric shapes, and the application should project the selected shape onto a hologram, while information about the shape is displayed on the screen.

All geometric shapes are listed on a screen. The user can select the shape he or she wants to learn more about, by tapping it on the screen. Then a new screen opens with a text about the shape along with the holographic display on the holographic pyramid.

For the second option, (ii) "Recognize geometric shapes", the application should project a random geometric shape on the hologram and allow the user to select one of three suggested geometric shapes. The three suggested geometric shapes are displayed as 2D representations on the mobile phone screen. The user selects the correct answer by tapping the selected geometric shape on the screen. One of the shapes is correct, the other two are randomly selected among the remaining geometric bodies from the pool of shapes. If the user selects the correct answer, he or she is presented with a new question. If the user selects an incorrect answer, he or she can try to answer the same question until they get it right, or they can view the correct answer. The application also has features to help the user answer the correct question if they did not choose the correct answer the first time. The application assists the user by showing him or her the random facts about the geometric shape used for the question.

The third option is game (iii) "Test your knowledge" where application should launch a quiz with questions shown on the screen, and the user should have the option to answer the questions. The user should get points for correct answers. For example, if the question is "Which geometric shape has six square faces?", the suggested answers could be: "A) Cube, B) Pyramid, C) Sphere, D) Rectangular prism", and the correct answer in this answer is A.

With the points scored in the quiz, the user can open rewards in the form of different types of patterns that he or she can apply to geometric shapes in game.



To meet the basic requirements, application should work with a set of at least 5 basic geometric shapes (cube, pyramid, sphere, rectangular prism and cylinder). For each of the predefined geometric shapes, a mechanism for customization (color or pattern of the shape), display and movement of this shape in a 3D environment must be prepared, as well as a set of questions for the quiz (questions and answers - correct and incorrect).

An additional functionality (optional!) is to allow the extension in a way that a new geometric shape can be defined by adjusting the settings of the application without changing the application code.

The application should have accessibility options on each screen to allow the user to customize the scene of the game to their needs and preferences.

Each screen should also have the ability to toggle the narrative option.

## NON-FUNCTIONAL REQUIREMENTS

### PERFORMANCE REQUIREMENTS

The application should ensure that the display of geometric shapes and their control by hand gestures is near real-time (no longer than 1 second should be spent on display and change geometric shape features based on hand movement).

Communication with the server part of the application should be asynchronous, in a separate thread, and possible communication delays should not directly affect the performance of the client part.

### SAFETY REQUIREMENTS

The application should inform the user to be mindful of their surroundings while using application.

### SECURITY REQUIREMENTS

The product should not store personal data such as real name, date of birth, etc. The only data that is stored is the user's progress and his or her anonymous identifier that only he or she knows. The data is stored on the server where the user cannot change it. The server only stores data that is important for game progress, such as points, rewards, etc.

### OTHER NON-FUNCTIONAL REQUIREMENTS

The graphic design should be simple and engaging. The user should be able to change the colour of geometric shapes and their size, and apply special avatars and patterns that they receive as rewards.

User interface interaction should focus on two major modalities:

- Simple UI on-screen buttons,
- Hand movements in a virtual 3D environment in holographic scenes.

## ACCESSIBILITY FEATURES

The application should offer different forms of content presentation, such as different sizes or colours of text or graphical elements. The graphic design should be simple, with simple UI on-screen buttons.

The application must offer multiple accessibility options on its settings screen such as turn on/off contrast mode and increase/decrease font size.

The application also has a feature that assists users by helping them answering the correct question if the correct answer is not selected the first time.

Each screen should also have option to toggle the narration.

# TECHNOLOGY

## EMERGING TECHNOLOGY

The product relies heavily on the use of 3D visualization technologies such as holographic technology. This technology allows the combination and overlay of real objects with virtual objects and information. In our application, we intend to use holographic technology to represent geometric figures in the spatial plane as holograms.

This technology supports educational inclusion as it arouses students' interest and thus enables effective learning.

## DEVELOPMENT TECHNOLOGY

The recommended technology stack for the Android solution includes:

- Figma, Adobe XD, or Invision – for developing a prototype,
- Unity Game Engine – multi-platform development software for application development
- leap motion SDK or Manomotion SDK – hand tracking solutions
  - <https://developer.leapmotion.com/>
  - <https://www.manomotion.com/>



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# Home phARmacy



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## PURPOSE

The SRS is intended for the developers of the software product Home phARmacy. The document provides guidelines for the development of the product Home phARmacy, including the product description, requirements and technology.

## PRODUCT SCOPE

This customizable application is intended to support taking and administering medications, vitamins and dietary supplements, and also providing basic first aid information.

The aim of application is to store the user's own home pharmacy (usual basic vitamins, supplements, painkillers and antipyretics, bandages, etc.) in a virtual form and it sends an alert about which box to choose and how to dose exactly in case of illness or therapy. The objective is to educate the users to take their vitamins and supplements regularly.

An important question is the input method we should use to store the data. A possible solution is to use the phone's camera to recognize the medicine box and save the usual dosage and other important information from an online repository. Or another suggestion is to print a sticker with a QR code at the pharmacy at the time of purchase, from which the app will read the personalized information and dosage. In this case, the user and the pharmacist must cooperate and the pharmacy must provide such services. Apart from this, the application warns you to take the current medicine and after taking it, the user must indicate that the take has been completed. This also helps with up-to-date inventory information.

Such a product should be designed according to the "design for all" principles (<http://designforall.org/design.php>).

## DESCRIPTION

### USER NEEDS

The application can be useful for elderly and people with cognitive disabilities who live an independent lifestyle, but they have difficulties in memorizing the dosage of their medications, or who have difficulties in choosing the right medication based on their symptoms.

### OPERATING ENVIRONMENT

The product is a mobile application (phone and tablet) which supports at least one of the two major mobile operating systems (Android and/or iOS). Alternatively, the product can be developed as a PC application, following the described guidelines.

## PRODUCT FUNCTIONS

This product is an application for Tablets or Mobile Phones. It will look like a virtual home pharmacy with AR-supports. On the main application screen, the user can select one of the following options:

- Home pharmacy,
- Suggestions based on symptoms
- First aid instructions.

Then, if the user has selected the Home pharmacy option, they can browse through content of their own home pharmacy with their usual dosage. Not only dosing information is available here, but e.g. the expiration date of the medicine, and the application warns you that if it is no longer suitable for use. If the Suggestions based on symptoms is selected, the user can compile their own set of symptoms using pictograms. Scanning pictograms, the application suggests the medicine with dosage (e.g., fever, headache.) in AR extension.

Finally, in the menu item First aid instructions the user gets help in the form of easy-to-understand pictograms in treatment of wounds and other activities. Here, there is a possibility to send alerts to a contact person.

## REQUIREMENTS

### FUNCTIONAL REQUIREMENTS

The application should have three modes available from the main menu: Home pharmacy, Suggestions based on symptoms and First aid instructions. (see in 2.2). The modes should be accessible through the press of the corresponding UI button.

The Home pharmacy mode uses data that need an input method. A possible solution is to use the phone's camera to recognize the medicine box and save the usual dosage and other important information from an online repository. Another method of administration may be to place a QR code on the package that provides personalized therapy information to the application. In this case, the user and the pharmacist must cooperate and the pharmacy must be provided with such services.

The application should have settings activity where the user can tweak the UI and other options according to his/her liking. Available options should include:

- language selection,
- turning the voice commands on/off,
- turning the contrast mode on/off,
- increasing/decreasing font size.

### NON-FUNCTIONAL REQUIREMENTS

#### SAFETY REQUIREMENTS

The application should inform the user to be mindful of the precise dose of medicines, dietary supplements and vitamins. The application recorded the dose instruction based on an input method and it cannot be overwritten by the user. The application reminds the user to always put medicines back in the same box.

#### SECURITY REQUIREMENTS

The application stores certain personal data of the user, e.g. medications needed for therapy and their dosage, taking other dietary supplements and vitamins, and even other health-related information. Providing this information is voluntary on the part of the user, who must accept that the application will work based on it. One of the functions of the application is to send an alert to a specified helper if necessary. Here he must consent to the fact that some of his data will be used by another person's application.

## OTHER NON-FUNCTIONAL REQUIREMENTS

The graphic design should be simplistic and engaging, when the application stores set of symptoms using pictograms (in mode Suggestions based on symptoms).

UI interaction should focus on two key modalities:

- simple UI on-screen buttons,
- voice commands (optional).

## ACCESSIBILITY FEATURES

- The application must ensure an option for voice command navigation.
- The application should also offer different forms of the content representation such as animation, image, or audio.
- The graphic design should be simplistic with simple UI on-screen buttons.
- The application must offer several accessibility options on its settings screen:
  - turning the voice commands on/off,
  - turning the contrast mode on/off,
  - increasing/decreasing font size.

## TECHNOLOGY

### EMERGING TECHNOLOGY

Great attention should be paid to the data protection. Since application is dealing with users' medical data, so 5G technology could potentially applied in this case. This product uses augmented reality.

### DEVELOPMENT TECHNOLOGY

The recommended technology stack for the Android solution includes:

- Figma, Adobe XD, or Invision – for developing a prototype,
- Android SDK – for app development,
- Text-to-speech API for implementing audio prompts (<https://developer.android.com/reference/android/speech/tts/TextToSpeech>) – alternatively, pre-recorded sounds may be used.



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