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INFORMATION TECHNOLOGIES STUDY PROGRAM

Problem-Based Project

**Web learning app
"Summerbod"**

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Preface

This project was done during the 4th semester of the study programme *Information Technologies* in the specialization of *Innovative studies*.

We chose the topic "Web learning app" during the project market on the first lecture of the subject "Problem-Based Project". The topic sounded very exciting because it relevant to modern youth who is keen on sports and health in general. Most of future athletes start from doing research and searching the web for material and tutorials and that's where our software will be helpful. So our team is motivated to make it easier for our peers and people who are looking for physical education online.

June 8, 2022

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Abstract

Any athlete, especially before starting doing sports, is looking for information and appropriate exercises to train. It is rare to find all the necessary information related to sports, correct forms and exercise instructions in one place on the Internet. And even if the information is conveniently accessible, it is often either inconvenient to use or full of intrusive advertising. It is worth adding that in most cases, such platforms are paid.

The Summerbod website can offer their users a large amount of exercises for any part of the body or muscle group. Each exercise has descriptions, detailed recommendations. However, perhaps the most important feature is the video instructions that will help the user learn the exercise quickly and practice it successfully. This method of demonstrating exercises will not only be convenient and speed up the learning time, but will also save our user from incorrect interpretations of the exercise, which can damage the user's physical condition. Also, our site offers a convenient exercise search function for users who already have their own personal exercise plan and want to find the exercises quickly and conveniently. SummerBod offers athletes a wide variety of exercises with the goal of diversifying their athletic routine. One of the main advantages of the SummerBod website is its modern design and presentation of information that meets the expectations of a modern person. The intuitive graphical interface allows users to quickly get acquainted and operate all the services and functions of the website. It's important to note that account creation is possible and recommended. Sign-in functionality allows you to quickly and securely create or connect to an existing SummerBod account. Any exercise can be liked and therefore saved to your profile for quick access in the future.

Combining all the benefits into one, „SummerBod“ is a modern website that is suitable for both beginners and advanced athletes that are looking for a handy instrument and place to plan and improve their routine.

Santrauka

Internetinė mokymosi programa "SummberBod"

Bet koks sportininkas, ypatingai prieš pradėdant sportuoti, ieško informacijos ir tinkamų pratimų asmeninei treniruotei. Bėda tame, jog retai internete galima rasti visos reikiamos informacijos susijusios su sportu, teisinga laikysena ir pratimų instrukcijom vienoje vietoje. O jei informacija ir yra patogiai pasiekiama, ji dažnai būna arba nepatogi naudojimui, arba pilna įkyrios reklamos. Vertėtų pridurti, jog daugumoje atvejų, tokios platformos yra mokamos.

„Summerbod“ svetainė gali pasiulyti vartotojui didelį kiekį sportinių pratimų bet kuriai kūno daliai arba raumenų grupei. Kiekvienas pratimas turi aprašymus, detalias rekomendacijas. Tačiau, bene svarbiausia ypatybė yra video instrukcijos, kurios padės vartotojui greit išmokti pratimą ir sėkmingai jį praktikuoti. Toks pratimų demonstravimo metodas ne tik bus patogus bei paspartins išmokymo laiką, bet ir gelbės nuo neteisingų pratimo interpretacijų, kurios gali padaryti žalos vartotojo fizinei būklei. Taip pat, mūsų svetainė gali pasiulyti patogią pratimų paiešką vartotojams, kurie jau turi savo asmeninį sporto planą ir nori greitai bei patogiai rasti reikiamus pratimus. „SummerBod“ siūlo sportininkams daugumą naujų pratimų su tikslu paįvairinti jų sportinę rutiną. Vienas iš pagrindinių „SummberBod“ svetainės privalumų – šiuolaikinis dizainas ir informacijos pateikimas atitinkantis šiuolaikinio žmogaus lūkesčius. Intuityvi grafinė sąsaja leidžia vartotojams greit apsibrasti ir patogiai operuoti visomis svetainės paslaugomis ir funkcijomis. Svarbu paminėti, jog svetainėje įmanomas paskyrų kūrimas. Prisijungimo funkcionalumas leis greitai ir saugiai susikurti arba prisijungti prie jau esamos „SummberBod“ paskyros. Esamus pratimus galima teigiamai įvertinti, taip pat išsaugant jį į naudotojo paskyrą.

Sudėjus visus privalumus į vieną, mes gauname modernią svetainę, kuri tinka tiek pradedantiesiems atletams, tiek jau pažengusiems sportininkams, kurie ieško patogios vietos savo rutinos planavimui bei tobulinimui.

Introduction

Nowadays it is popular to pay attention to personal health and physique. We are seeing more and more people at the gym each day no matter their age, gender or even experience. We believe that our website contains the most crucial information for starting and advanced athletes. However, our team prioritized the pleasant user experience which is important criteria for our target audience. With “Summerbod” user can freely explore the material and improve his workout routine. In addition to that, “Summerbod” also contains important information about health, facilities to explore new exercises, which can be rated, answer the health and exercise related questions to improve and test their knowledge, accept athletic challenges and many more. In addition, every user can create his own protected account where he can store all the vital information and his athletic routine. The user can even create their own exercises if they see a need to do so. However, all of these functionalities can be really expensive on other fitness websites. Therefore, it is important to mention, that our website solves this problem by providing all of the services for absolutely free. They can be approachable to all users without any subscriptions or one-time payments. The website was designed to be friendly for all types of users no matter their experience. There are workout descriptions, explanations, gifs on how to do certain workouts in order to help the non-experienced users to learn the exercises and get better at working out.

1 Related Work

To stand out in quite a saturated market of fitness websites we have conducted related work analysis, to make sure we are different and not suffering from common HCI problems.

We have picked the most upvoted websites mentioned in the most popular forum platform - "Reddit" and top three were:

1. www.strongerbyscience.com
2. <https://exrx.net/>
3. <https://www.bodybuilding.com/>

1.1 Strongerbyscience.com analysis

This website claims to be the #1 online sports nutrition retailer and most-visited fitness website to date, it also has an "Excellence" reward from "bizrate insights", which makes it a tough challenge to beat for our website, however it does not make it perfect.

Availability and Accesibility

When the user navigates to "Workouts" section and tries to browse exercises, a paywall immediately blocks access and makes it impossible to learn anything without subscribing to their trainer program. Availability and Accesibility is immediately struck down and a casual user would most likely click away.

Clarity

Website is simple, clear and consistent.

Learnability

Design choices are modern and easily approachable.

Credibility

Website has an "About us" page and is based on research articles.

Relevancy

Content is relevant to fitness.

1.2 Exrx.net analysis

This website claims to have an average of 50,000 individual visitors per day around the world and it prides itself on a fact that it has been established back in 1999 as a resource for exercise professionals, coaches and fitness enthusiasts. However time not only brings credibility, it also forces modernization and updating, which has not been on par with new fitness websites.

Availability and Accesibility

All types of exercises are available to users, however some GIF's have broken links and fail to load properly.

Clarity

Website is cluttered with outdated image boxes of different colours. Opening the side-menu brings up 30+ menu items, which can not be collapsed. Opening the "Exercise libraries" brings out an extremely confusing test-only page with all possible muscles, without any modern way of differentiating shown items. This design-choice repeats as you navigate further.

Learnability

Design choices are outdated and site navigation is cluttered and hard. The layout is entirely unfamiliar to an average teenager/young adult.

Credibility

Website has an "About us" page and is constructed with the help of medical and weightlifting professionals.

Relevancy

Content is quite relevant to fitness, however in the same page with the "Exercise Libraries" there are marketing boxes for their API, which could be displayed separately from the main information.

1.3 Bodybuilding.com analysis

This website is entirely made of research article references and doesn't seem to have any information about exercises themselves, it's a different approach to a fitness website, however it seems to lack actual training directions.

Availability and Accessibility

Research articles are available and accessible to any user.

Clarity

Website is simple, clear and consistent.

Learnability

Design choices are modern and easily approachable.

Credibility

Website does not have an "About us" page, however every page is a research article.

Relevancy

Despite it being a fitness website, there is an extremely restricted amount of exercises, the majority of available information seems to be extra help for working out in general, like breathing techniques and correct diet. The main navigation menu displays only 3 exercises: Squat, Deadlift and Benchpress.

1.4 What about us?

Our website has been created by a few motivated fitness-enthusiasts, however it has been improved and backed by research and anonymous trainers from our local gyms. The site is dedicated to the physical aspect of fitness and is focused on correct techniques of working out every part of human body.

Availability and Accessibility

Every part of our website is entirely available and accessible by any user. No pay-walls and no broken links.

Clarity

Website is simple, clear and consistent with it's design choices. Same colour palette throughout our content to make it easy on the eyes. There is no unnecessary clutter, every piece of information is important/relevant and the layout is intentionally minimalistic.

Learnability

Design choices are modern and easily approachable. Navigation is assisted with drop-down menus and every button has a clear purpose.

Credibility

We do not have an "About us" page, however it is in the works. Credibility often comes with time and criticism, which is quite impossible in a brand new website, however our workout technique is backed up with research articles, which you can see in the reference section at the end of the document.

Relevancy

The website follows its purpose in every tab, everything you can find is closely tied with working-out. We even decided to exclude dietary sections, to purely focus on physical guidance, thus improving the relevance of the website as a whole.

2 Project Deployment

The main idea of the deployment was to have a script, which would deploy the project from step 0. This Ansible script creates a virtual machine on the MIF environment, downloads all the necessary files and configures the server. This was done mainly to speed up the process of creating and configuring new server every time we needed one. The deployment mainly consists of 4 major parts which are `Launch.sh`, `Create_VM.sh`, `Server_setup.sh` and `Ansible_main.yml`. Every one of them have a specific purpose for the whole script. Below you can see a short description on what each part does and further down you can see a simple representation of the whole process.

Launch.sh – this part is mainly used to start the whole process, put the necessary flags into the Ansible configuration file and download the needed Ansible Galaxy role for better configuration.

Create_VM.sh – this part is responsible for the creation of the virtual machine and for copying the project files into the server. When this part starts, the user will be asked to provide MIF OpenNebula username and password, after the credentials where passed, the script will create a new virtual machine for that account, using our configured vm template. Once the virtual machine starts, connection information will be copied to the Ansible hosts file as well as the Ansible variables file (the ip and the port is used later for base url configuration). Finally, the script copies the project directory to the remote host via the scp command.

Server_setup.sh – this part is used to create a new user with root privileges on the remote machine that `Create_VM.sh` launched. It also creates an SSH directory for that sudo user, copies authorized keys from root, adjusts ownership and permissions and disables root SSH login with password.

Ansible_main.yml – this is the most broad part of the script. This Ansible playbook is used to install and setup LAMP (Linux, Apache, Mysql, Php) packages, do migrations and seeds and configure the server. After installing the LAMP packages, the playbook creates the document root for the project as well as sets up the Apache virtual host and disables default site. Then, begins some Mysql configurations that include removing all anonymous users, removing test databases and creating a new admin user. Once Mysql is set up, file movement and permission setting begins. The playbook moves all the necessary files into the required places (like project directory to Apache) and sets permissions for required files (like allowing to write to images folder or granting rights to writable folder and so on). Finally, some general configurations are made. These include adding htaccess files, increasing php upload size, enabling production environment, creating a new database, doing migrations and seeds, changing the app base url and restarting Apache.

Once the script finishes its work, all the user needs to do is to just enter the page url and port into the web browser and the website will be fully functional.



Figure 1. Deployment diagram

3 Wireframes

Wireframes serve multiple purposes by helping to:

1. Connect the site's information architecture to its visual design by showing paths between pages.
2. Clarify consistent ways for displaying particular types of information on the user interface.
3. Determine if various HCI principles are possible to follow in advance.

We sketched out 4 main pages of our future website, to visually evaluate it's usability.

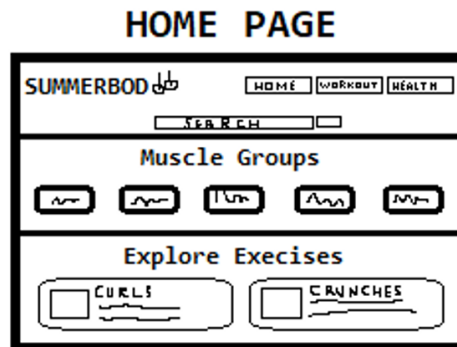


Figure 2. Home page wireframe

Our home page has to be easily navigable, multiple buttons in visually segmented sections, serving different navigation purposes as well as a little preview section with the "Explore Exercises" title for quick access to an example to our content.

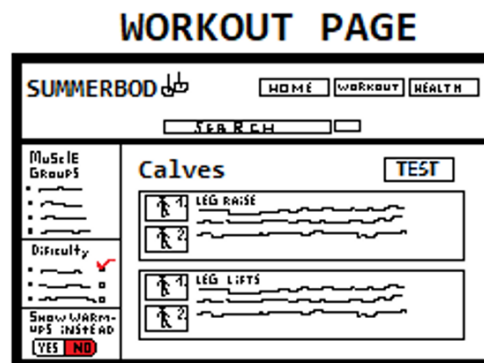


Figure 3. Workout page wireframe

Our workout page has to focus solely on exercises themselves, so the biggest part of the screen is reserved only for them, however it's still important to provide easy navigation between those exercises, which gave us the idea of a side-navigation bar, which is both unobtrusive and functional.

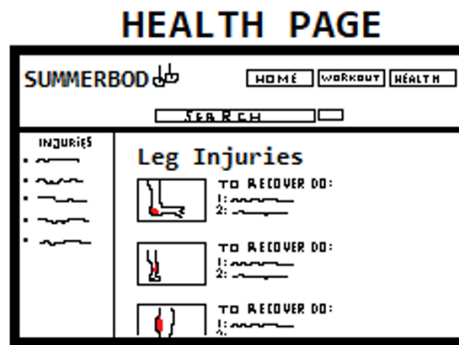


Figure 4. Health page wireframe

Our health page was the only page, that in the process of development surpassed the vision of our early wireframe, in the wireframe it was rather minimalist with style similar to the workout page, however we decided to add a BMI calculator and diversify health information in more ways than just muscle group categorization.

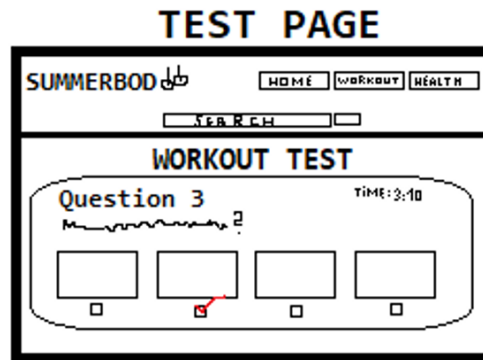


Figure 5. Test page wireframe

Finally, our test page has to be clear and minimalist, because its purpose is not to distract the thinking user, but provide a clear UI to easily think about provided questions.

4 Used Technologies

CodeIgniter 4

This project has been developed with the help of CodeIgniter4 framework. The CI4, has given us a stable foundation by providing a rich set of libraries for commonly needed tasks, as well as a simple interface and logical structure to access these libraries. It uses the MVC (Model, View, Controller) structure, which has been used to control view navigation, to corral data straight from the models, instead of pre-building databases and helped overall functionality with additional libraries.

Ansible

This project needed automation, so for that we used Ansible scripts. Its function is to create a virtual machine on the MIF environment, downloads all the necessary files and configure the server with minimal manual input.

Apache

This project also needed a fast, reliable, and secure webserver to run the website, for this we used Apache. Apache also provides a variety of features such as URL rewriting, proxy and other modules. It is also open source and widely accepted.

Phpmyadmin

Finally we were in need of a simple tool to handle the administration of MySQL database over the Web, Phpmyadmin provided every functionality for maintaining, changing and testing the database.

5 Algorithms

5.1 BMI calculator

Body Mass Index is a simple calculation using a person's height and weight which is used to determine a regular person's body type [4]. This proves useful when starting your sports journey, as the workout types may be picked specifically to tackle certain problems and achieve wanted goals as fast as possible.

The formula we used in our calculation algorithm is **BMI = kg/m²** where kg is a person's weight in kilograms and m² is their height in metres squared.

For males below the age of 20 we use values:

1. BMI < 19.1 = Underweight;
2. BMI >= 19.1 and BMI <= 27.1 = Normal Weight;
3. BMI > 27.1 and BMI <= 31.1 = Overweight;
4. BMI > 31.1 = Obesity.

For females below the age of 20 we use values:

1. BMI < 17.8 = Underweight;
2. BMI >= 17.8 and BMI <= 26.6 = Normal Weight;
3. BMI > 26.6 and BMI <= 32.6 = Overweight;
4. BMI > 32.6 = Obesity.

For adults we use values:

1. BMI < 16 = Severe Thinness;
2. BMI >= 16 and BMI <= 18.5 = Underweight;
2. BMI > 18.5 and BMI <= 25 = Normal Weight;
3. BMI > 25 and BMI <= 29.9 = Overweight;
4. BMI > 29.9 = Obesity.

6 User System

Summerbod website has a rather simple but effective user system. In this section, you can read about the user types and what they are able to do, as well as see a simple representation of the user system at the bottom of this section.

Guest user – On our website, the guest user (a user who does not have an account) can use nearly all of the functionalities. We noticed that for some people creating an account and logging in can be annoying, so guest users are free to browse all the workouts, check their fitness knowledge in our quiz page, read health and posture advices and etcetera. However, some functionalities are available only for a registered user.

Registered user – Creating an account is super simple, all we require is your name, email and password. A registered user gains access to a few new functionalities, which allow extending the website and accessing certain workouts faster. First functionality is creating your own exercise. It allows the user to import their own exercise if they feel that their preferred ones are missing or for any other reason. Other functionality that is available for the registered user is favorite workouts list. Adding an exercise to their favorites allows users to access them faster and to have all of them at one place in their profile page.

Admin user – An admin user is responsible for managing users and workouts. Instead of a profile page, which a normal user sees, and admin is taken to the dashboard page where all the data from the database is displayed. From there the admin can remove a certain user if some rules were broken or for any other reason. In addition, they can also remove exercises, if there are some duplicate ones, or if they have mistakes in their description and so on.

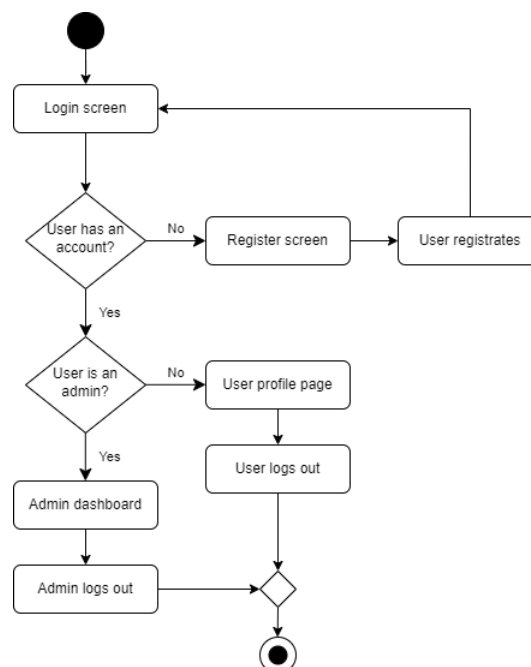


Figure 6. User system diagram

In the future, we are planning to add more functionalities for the registered user as well as for an admin. New ideas may include badges, challenges, forums for the registered user and ability to edit workouts, add new workouts for the admin.

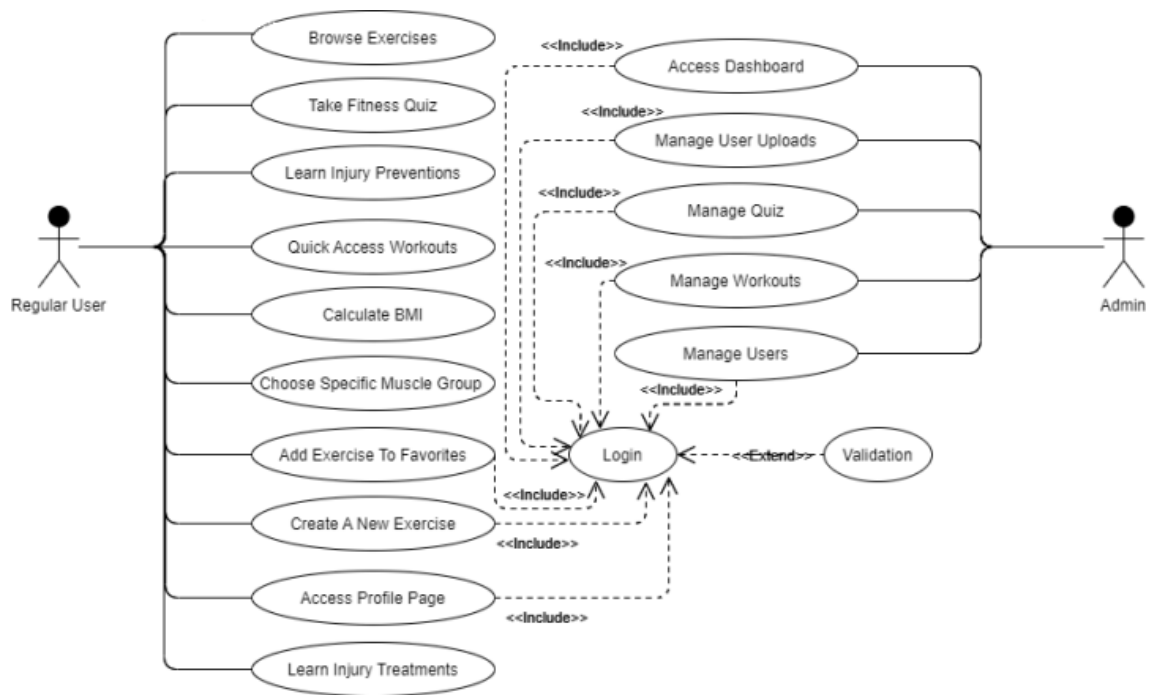


Figure 8. Use case diagram

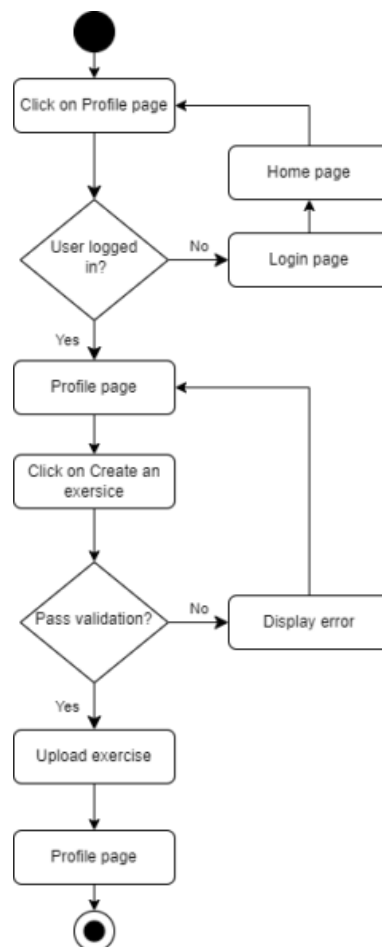


Figure 9. Exercise upload diagram

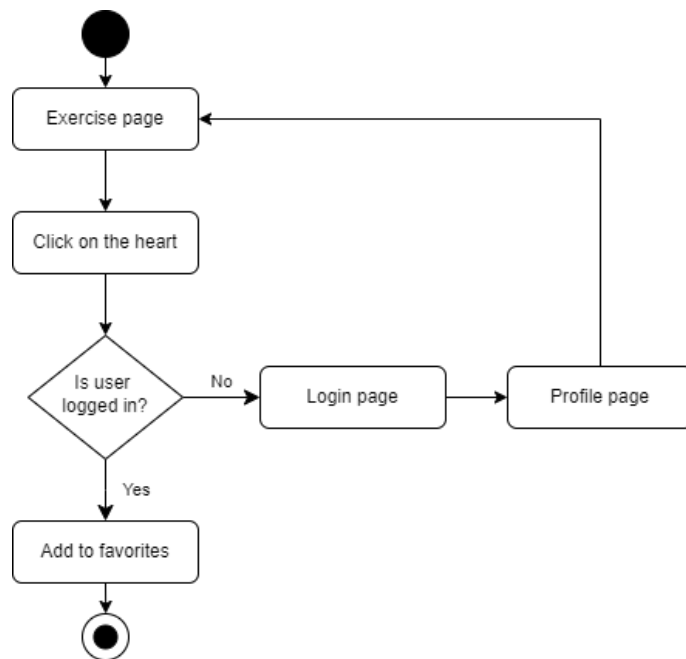


Figure 10. Favourite exercise diagram

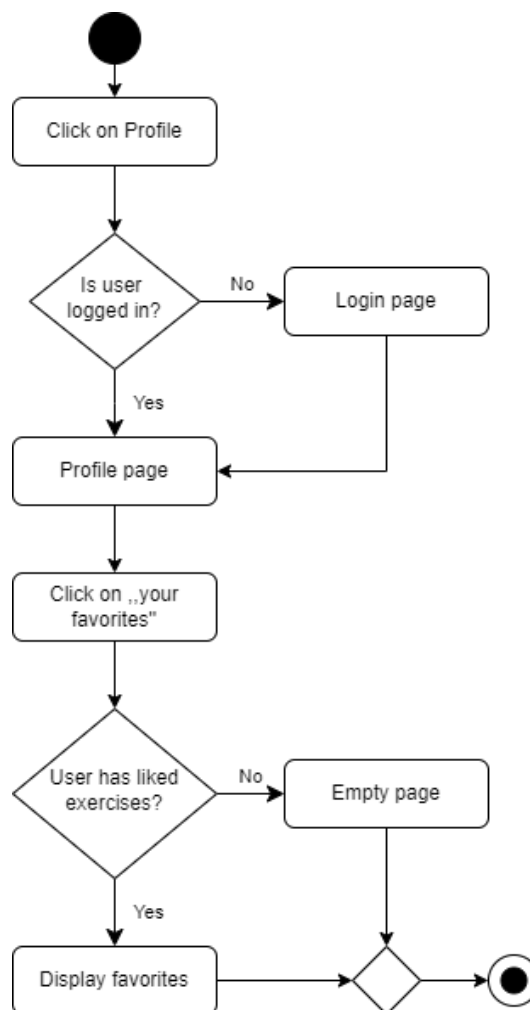


Figure 11. Display favourite exercises diagram

8 Muscle Groups

Human body has a staggering amount of muscles, which more often than not rely on each other and are responsible for same areas of the body, so they can be grouped/categorized for convenience as follows.

Every muscle group in depth:

- **Traps** - muscle made up of particularly long muscle fibers that spanning a large width of the upper back. Functionally, this enables the trapezius to assist in mainly postural attributes, allowing and supporting the spinal column to remain erect when the person is standing.
- **Traps mid-back** - muscle sits just below the upper trapezius. It goes all across your shoulders. The middle traps is responsible for helping you pull your shoulders back and extend your arms behind you and stabilizing your shoulders when you move your arms.
- **Shoulders** - muscle providing support and producing the movements of the shoulder girdle. They attach the appendicular skeleton of the upper limb to the axial skeleton of the trunk. Four of them are found on the anterior aspect of the shoulder, whereas the rest are located on the shoulder's posterior aspect and in the back. One important function of the deltoid is preventing joint dislocation when a person carries heavy objects.
- **Chest** - muscles that connect the front of the human chest with the bones of the upper arm and shoulder. This region contains four muscles that provide movements to the upper limbs or ribs.
- **Biceps** - large muscle that lies on the front of the upper arm between the shoulder and the elbow. Both heads of the muscle arise on the scapula and join to form a single muscle belly which is attached to the upper forearm. While the biceps crosses both the shoulder and elbow joints, its main function is at the elbow where it flexes the forearm and supinates the forearm.
- **Forearms** - muscles, including the, flexors and extensors of the wrist, flexors and extensors of the digits, a flexor of the elbow (brachioradialis), and pronators and supinators that turn the hand to face down or upwards, respectively.
- **Abdominals** - muscles forming the abdominal walls, the abdomen being the portion of the trunk connecting the thorax and pelvis. An abdominal wall is formed of skin, fascia, and muscle and encases the abdominal cavity and viscera. These muscles support the trunk, allow movement, hold organs in place, and are distensible
- **Quads** - muscles that are present on the front of the thigh. They consist of four distinct muscles: the rectus femoris, the vastus lateralis, the vastus intermedius, and the vastus medialis. They are responsible for extending the leg and helping with movements such as walking and jumping.
- **Calves** - complex muscle that is fundamental for walking and posture. Gastrocnemius forms the major bulk at the back of lower leg and is a very powerful muscle.
- **Triceps** - large muscle on the back of the upper limb of many vertebrates. It consists of 3 parts: the medial, lateral, and long head. It is the muscle principally responsible for extension of the elbow joint (straightening of the arm).

- **Lats** - large, flat muscle on the back that stretches to the sides, behind the arm. This muscle is responsible for extension, adduction, transverse extension also known as horizontal abduction (or horizontal extension), flexion from an extended position, and (medial) internal rotation of the shoulder joint.
- **Lower-back** - muscles that are attached to back of the spine and enable standing and lifting objects. They help hold up the spine, and gluteal muscles, enable flexing, bending forward, lifting, and arching the lower back.
- **Glutes** - The gluteal muscles, often called glutes are a group of three muscles which make up the gluteal region commonly known as the buttocks. Functions of the muscles include extension, abduction, external rotation, and internal rotation of the hip joint.
- **Hamstrings** - The hamstrings cross and act upon two joints – the hip and the knee – and as such they are termed biarticular muscles. Semitendinosus and semimembranosus extend the hip when the trunk is fixed; they also flex the knee and medially (inwardly) rotate the lower leg when the knee is bent.

It is extremely important to not ignore certain muscle groups, because of personal preferences. Every muscle group provides benefits for day to day strain on the body and training only certain areas can even increase the risk of injury in the future [3] [5]. This topic also expand onto our stretching/warm-up category, which is just as important [2] [1].

9 Requirements

9.1 Functional

Must Have Features:

- Make a fully functional website with a pleasant and simple UI.
- Ability to select randomized balanced workout plans.
- Ability to calculate your BMI (body mass index).
- Ability to add or remove a custom exercise.
- Ability to learn how to perform different exercises correctly.
- Ability to access a base of exercises for every muscle group.
- Ability to use the “Health” section for treating/preventing injuries.
- Ability to like and therefore save all exercises.

9.2 Non-Functional

Availability:

- The website should be available for every internet user.
- The website should be free-to-use for everyone.

Usability:

- The website should support 1,000 user added exercises.
- The website should be easy to use for all age gaps.

Security:

- The website should not store any sensitive data from the user.
- The website should use a custom log-in system.

10 Nielsen's 10 Usability Heuristics (1994):

- **Visibility of system status** - Website has many aspects where it tries to communicate with the user to show him current status of the task. User login form, exercise upload form and BMI calculator have legitimisation to prevent incorrect input, which displays relevant error messages, with directions to follow. Favoured workouts appear with red heart emoji that reminds the user that the exercise has already been added.
- **Match between system and the real world** - All pages have user-friendly language without any technical terminology. All the workout titles, descriptions and buttons are easy to understand and are familiar to average internet user. Objects that are used in our system are real world object, like heart emoji for like and dictionary icon for translation
- **User control and freedom** - Every main category is always shown in the header so that user could easily switch between those pages. Our logo is a shortcut to our home page which is a quite intuitive and basic way to navigate the user. BMI calculator and filters above the workouts have buttons to clear all information. Workouts upload is a small pop-up window in the right corner so that user can easily see the rest of the information and there would be no need to redirect him.
- **Consistency and standards** - All the contents page have the same patterns of listing. All workouts have identically structured information describing it. Upper navigation bar always stays the same throughout navigation, to keep important pages quickly accessible at any time. We used the same design standarts, that are widely accepted and used, so that the user has a clear idea on usage right away.
- **Help users recognize, diagnose and recover from errors** - All the legitimisation functionality that is used on all forms and input boxes are created for recognition as well. User can easily escape all the errors with the help of messages that are being shown after the problematic input.
- **Error prevention** - Website's login form and BMI calculator have legitimisation which prevents user from entering insecure or incorrect data. In case our user will enter non-existing link we also have 404 error page which will help our user to identify the problem of his location.
- **Recognition rather than recall** - Website tries to be simplistic without additional unnecessary elements, buttons and contents. All the crucial information is always placed in the same place and easily retrievable when needed.
- **Flexibility and efficiency of use** - Summerbod has implemented accounts where user can store his favourite exercises to avoid searching them every time among all the other exercises in the category. Also user can quickly sort all the exercises to make the searching process easier. He can also use search bar to search for any workout that is stored on the website.
- **Aesthetic and minimalist design** - Website does not contain any irrelevant information or buttons that are rarely used. All the important elements are stored in the upper navigation bar. Website has consistent design with the use of the same design code, colours and forms. Visuals are modern compared to most of the athletic learning sites on the internet.

- **Help and documentation** - All the useful papers are stored in the same file with the project. For any additional help users can always contact developers via details that are stored in the footer.

Conclusions and Recommendations

Our development team saw many flaws in other fitness websites, from outdated design to exorbitant subscription prices, so this project seeks to fulfill all the needed functionality for an athlete, without paywalls and outdated navigation. We seek to enhance the overall working-out experience, regarding both the ease of relevant information access for standard exercises and an addition of a health section which will either prevent injury or help the user get through it. People of all ages and all body-types can use our website and learn to improve their physical form with ease. This work also may be extended further with the help of our users, by adding more safe and approved exercises to our database.

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