

AN INTELLIGENT PROGRAM TO CONNECT PEOPLE WHO WANT TO DO SPORTS WITH OTHERS USING SORTING METHOD ACCORDING TO THEIR SKILL LEVEL, SPORTS, LOCATION, AND TIME

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ABSTRACT

ConnACT is a mobile application designed to connect individuals seeking sports partners [11]. It addresses the challenge of finding compatible players by considering factors such as sports preferences, skill levels, location, and any relevant medical conditions. The app uses its algorithm to match users with suitable games and partners, fostering a more inclusive and active sports community. It also offers features for creating and joining games, including options for Special Olympics athletes [12]. The development of ConnACT involved overcoming challenges related to platform limitations, geolocation integration, and user profile customization. The effectiveness of the app's game sorting and rating systems was evaluated through multiple measures of experimentation, demonstrating both functions properly, and revealing insights into how the app works [13]. ConnACT distinguishes itself from existing solutions by prioritizing inclusivity and comprehensive game-finding. This app has the potential to significantly enhance the accessibility and enjoyment of sports for individuals of all abilities, promoting physical activity, social interaction, and overall well-being.

KEYWORDS

Sports, Community, Games, Special Olympics

1. INTRODUCTION

I have been playing sports for most of my life, but I often face a recurring problem: finding suitable people to play with. This challenge stems from the modern lifestyle, which complicates social interactions due to varying schedules, locations, and skill levels. As an introverted athlete, joining random games can be intimidating, especially when there's a disparity in skill levels. Moreover, disabled people also need to find people who share their experience to play sports. It is hard for them to compete with other people due to their medical conditions, so they also need an effective way to get to know others to do sports with. This problem is important because it affects athletes' ability to engage in sports, which are crucial for physical and mental well-being. The difficulty in finding compatible players can lead to decreased participation, affecting long-term health outcomes.

According to a survey by the NCHS, only 23% of adults in the U.S. meet the recommended physical activity levels, with social barriers being a significant factor [1]. This problem not only affects athletes, fitness enthusiasts, but also the everyone as a whole, as decreased physical activity can lead to higher rates of obesity, cardiovascular diseases, and mental health issues. As for disabled people, it is safe to assume that they exercise less than any healthy person, suggesting that a even smaller number than 23% of the disabled population need more exercise. While powerlifting apps, My Jump for example, are effective in bettering personal performance by providing accurate data, they focus on individual fitness rather than facilitating a community.

A community that connects like-minded people together. ConnACT brings more to the table than just sports. Duatlet, on the other hand, serves a more similar function to ConnACT [14]. Duatlet also help people find sports buddies, but have not yet produced a final product. Moreover, ConnACT evaluates users with a more accurate model, ensuring that all users can truly find their best match, who they can compete and improve with. Tinder also utilizes a special algorithm to match users. However, while Tinder's matches users who are romantically attracted to each other, ConnACT provides a more nuanced approach to matchmaking, ensuring that users are paired with others of similar abilities and interests. These advantages make allows ConnACT to not only help people find competitive games and opponents, but also provide a bridge that cross the information barrier, connecting people who want to do the same things.

My solution, ConnACT, is an innovative app designed to connect individuals looking for sports partners [7]. This app addresses the challenge of finding suitable players by analyzing users' sports preferences, positions, locations, skill levels, and any relevant medical conditions. ConnACT then recommends games that match users' criteria, ensuring they can compete and enjoy themselves. Users can also create their own games, specifying details such as skill level, location, sport, and whether it's a Special Olympics game. The app then recommends these games to players of similar skill levels in the nearby area.

ConnACT effectively eliminates the common barriers to finding sports partners, such as schedule mismatches, location differences, and skill disparities. By providing a platform where individuals can easily find others with similar interests and abilities, ConnACT fosters a more inclusive and active community [8]. This solution not only encourages physical activity but also promotes social interaction and mental well-being by making it easier for people to connect through sports. Moreover, ConnACT's emphasis on inclusivity, including options for Special Olympics games, ensures that individuals of all abilities can find suitable and enjoyable sports activities [9]. This is particularly important for promoting diversity and ensuring everyone has the opportunity to participate in physical activities. By bridging the gap between isolated players and potential sports partners, ConnACT offers a comprehensive solution that can significantly enhance the quality of life for its users [10].

We were attempting to test the accuracy of two systems: the player rating system and the game sorting system. These are two of the most important functionalities in the app. To test the player rating system, we created a mock game, gave each player an example score, and identified how their average rating changed. We noted that the scores of rated players changed predictably, while the scores of players who were not rated did not change in the desired way. Although there may be future bugs to identify, this functionality is generally positive. To test the game sorting system, we created 8 mock games, each varying distances from a user's original location. The games were spaced 1, 5, 10, 15, 20, 25, 30, and 35 kilometers away. We then identified which games showed up to the user and narrowed down the threshold of when visibility changes with more specific games. All expected games were displayed, which indicates that there are not any direct issues with the algorithm that gets the closest games from the database.

2. CHALLENGES

In order to build the project, a few challenges have been identified as follows.

2.1. The Limitations Of Flutterflow

One of the major challenges I faced in implementing ConnACT involved the limitations of Flutterflow, particularly when it came to features that weren't natively supported, such as developing a system for game creation, sorting, and calculating user ratings. To address this, I needed to think creatively about how to extend the platform's functionality. I could utilize custom code within Flutterflow's custom code section to build these features. This approach would allow me to overcome the platform's constraints by writing tailored solutions, ensuring that the app's core functionality aligns with user needs. Potential problems like integration issues or maintaining code compatibility with Flutterflow's updates could arise, and I would address these by implementing thorough testing and regularly updating custom code to ensure seamless operation.

2.2. The Lack Of Built-In Functionality In Firebase

Another significant challenge I encountered in implementing ConnACT was the lack of built-in functionality in Firebase to retrieve and manage user and game locations [2]. Without this capability, it would be impossible to sort games by proximity, leading to users receiving recommendations for games located far from them, potentially even on the other side of the world. To address this issue, I could use GeoFlutterFire, a library that extends Firebase's capabilities by enabling geolocation queries. This solution would allow the app to access and sort data based on proximity, ensuring that users receive relevant and nearby game recommendations. Potential challenges include integrating GeoFlutterFire smoothly with the existing Firebase setup and ensuring that the usage of vpns on the user side will not cause actual troubles in finding their location.

2.3. The Lack Of Built-In Functionality For Users

A significant challenge in implementing ConnACT was the lack of built-in functionality for users to choose and store profile pictures. Without this feature, all user profiles would be devoid of personalization, potentially affecting user engagement. To resolve this, I could use custom code to convert images into a string of text that can be stored in Firebase. This approach would enable the app to store and retrieve user images effectively, allowing for personalized profiles. Potential issues such as image quality or storage limitations could be addressed by optimizing the image conversion process and ensuring efficient data handling within Firebase.

3. SOLUTION

The structure of ConnACT revolves around three major components: game creation, game sorting, and detailed user profiles. The game creation feature allows users to create sports games by specifying details like the sport, skill level, location, and any special conditions (e.g., for Special Olympics). This ensures that games are tailored to participants' needs and preferences. Once games are created, they need to be efficiently sorted and recommended to users. This game sorting component uses algorithms to match users with games based on proximity, skill level, and availability, ensuring that players find the most suitable matches. Moreover, users create specific and detailed profiles that include information about their preferred sports, skill levels, and any relevant medical conditions. This information is crucial for accurate game recommendations and

matching users with others of similar interests and abilities. The flow of the program starts with a splash screen displaying the ConnACT logo, followed by an account creation process. Once registered, users can set up their profiles, adding personal information and preferences. Afterward, they can explore a page dedicated to joining sports games, where they can find and join games close to their location. Alternatively, they can create their own games, which will then be recommended to other users. After a game ends, participants can rate each other based on performance, fostering a community of feedback and improvement. Additionally, users can view their past activities in the games history page.

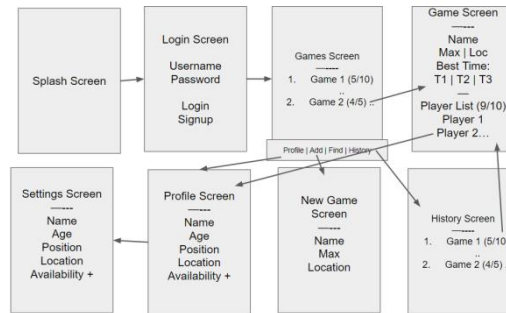


Figure 1. Overview of the solution

ConnACT creates a detailed user profile for individual users, dividing them by sport, location, skill level, and willingness to participate in special olympics games. This component of the program ensures that every user can find games that fit them the most, allowing them to compete and have fun.

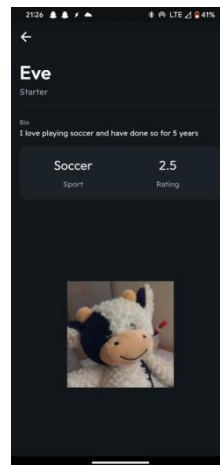


Figure 2. Screenshot of rating

```

12 Future<double> ratingscalc(List<int>? ratings) async {
13   double avgratings = 2.5;
14   if (ratings!.isEmpty) {
15     int total = 0;
16     for (int i = 0; i < ratings.length; i++) {
17       total = total + ratings[i];
18     }
19     avgratings = total / ratings.length;
20   }
21   return avgratings;
22 }

17 Future<String?> uploadconvertimage() async {
18   var bytes;
19
20   // Use the ImagePicker to take a picture
21   final XFile? pickedFile =
22     await ImagePicker().pickImage(source: ImageSource.camera);
23
24   if (pickedFile == null) {
25     return "";
26   }
27
28   bytes = await pickedFile.readAsBytes();
29   String img64 = base64Encode(bytes);
30
31   return img64;
32 }

```

Figure 3. Screenshot of code 1

Users are evaluated by a lot of features, one of those being their ratings. After a game, people can all rate their sport partners. As shown in the ratingscalc part of the code, for every new rating entered by an user, it adds up to the total ratings. This total ratings will be divided by the number of users who rated this player and return the average value of the ratings for that selected player, providing more insights to his or hers performance on the court. Users can also customise their profile via features like their profile picture. Users can pick images from their phone, and that image would be demonstrated as the profile picture. If the user does not want to upload an image, then this action would cancel the process of saving the picture. If they do upload an image, then the program converts and save the image.

Users can create regular or special olympics games of specific skill level, location, and sport. These games will only be visible for other users that fits the selected skill level, location, sport. Moreover, special olympics games will also be only visible to people with disabilities who signed up for the special olympics feature of this program.

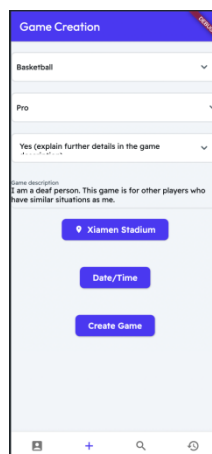


Figure 4. Screenshot of game creation

```

12 import 'package:geoflutterfire2/geoflutterfire2.dart';
13
14 Future<DocumentReference> gamecreation(String? skillLevel, String? sport,
15   DateTime? time, LatLng? location, String? locationname) async {
16   final geo = GeoFlutterFire();
17   final _firestore = FirebaseFirestore.instance;
18   GeoFirePoint myLocation =
19     geo.point(latitude: location!.latitude, longitude: location!.longitude);
20   return _firestore.collection('Game').add({
21     'GamLocation': myLocation.data,
22   });
23 }

```

Figure 5. Screenshot of code 2

Every single value the user input on the game creation page will be saved in firestore as a new game containing information of the skill level, sport, time, location, name of that location, and most importantly, whether the game is a special olympics game or not. To save the location, ConnACT utilizes GeoFlutterFire, giving the latitude and longitude of the game location, which helps the game sorting system sort the games by distance. The code of saving other features are not shown in the picture above but follows the same logic. If the user has not filled out any of these required informations, the game will not be created. Furthermore, the number of the participant of each game would also be saved in the data base. The game automatically includes the game creator as its first participants, adds it to the user's games, and appears on the creator's game history page.

Any games created would be sorted by features like skill level, location, and sport. These games will only appear on an user's screen if his or hers conditions matches the requirements of the game. ConnACT divide games so that any users can find the game that they are going to have the most fun in.

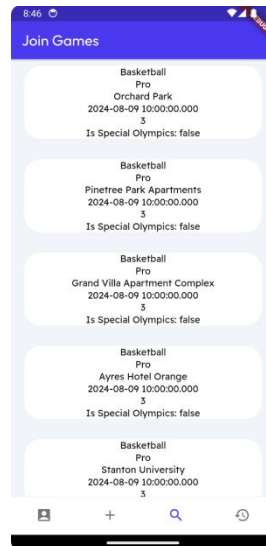


Figure 6. Screenshot of the games

```

12 import 'package:geoflutterfire2/geoflutterfire2.dart';
13
14 Future gamesorting(
15   LatLng currentPosition,
16   double radius,
17   Future Function(List<GameRecord> games) callback,
18 ) async {
19   // Add your function code here!
20   // Init firestore and geoflutterfire
21   final geo = GeoFlutterFire();
22   final _firestore = FirebaseFirestore.instance;
23   // Create a geoFirePoint
24   GeoFirePoint center = geo.point(
25     latitude: currentPosition.latitude, longitude: currentPosition.longitude);
26   // get the collection reference or query
27   var collectionReference = _firestore.collection('games');
28   String field = 'location';
29   Stream<List<DocumentSnapshot>> stream = geo
30     .collection(collectionRef: collectionReference)
31     .within(center: center, radius: radius, field: field);
32   stream.listen((List<DocumentSnapshot> documentList) {
33     List<GameRecord> sortedGames = [];
34     documentList.forEach((DocumentSnapshot document) {
35       GameRecord game = GameRecord.fromSnapshot(document);
36       print(game);
37       sortedGames.add(game);
38     });
39     callback!(sortedGames);
40   });
41 }

```

Figure 7. Screenshot of code 3

As shown above, games will only be recommended to users who fits the requirements of the games. The app obtains the location of the phone of the user. Then, it uses GeoFlutterFire to find games of matching locations. Only the games within the 10 miles radius to the user would appear on the join games page of the phone. ConnACT then sorts the game from closest to furthest. Games are also sorted by skill level, sports, and whether the games are special olympics or not. In the ends, only the users with matching skill level, sport, and willingness to participate in special olympics will see the matching games appear on their phone. For example, a user who claims himself to be a starter athlete will only get game recommendations of starter level games. Only basketball players will be recommended basketball games. By the game sorting method, ConnACT makes sure that everyone can have fun in their games.

4. EXPERIMENT

4.1. Experiment 1

During the app development, we've always been running into some problems with the finding games function of the program. If a game is too far away from the user, then it won't show on the user's screen. How far does a game have to be to not get recommended?

In order to test the maximum distance till a game would not be recommended to a user, we use a very simple method—setting up 8 games that are each 1, 5, 10, 15, 20, 25, 30, and 35 kilometers away from an imaginary user. All the other values are consistent. These games will all have the same skill level, time, sport, and are all not Special Olympic games. If any of these games do not show, we set up another game that is 1 kilometer closer to the user than the closest game that is not showing. By that, we can get the exact value of at what distance would the system stop recommending games.

Distance	Visibility
1	Yes
5	Yes
10	Yes
15	Yes
20	Yes
25	Yes
29	Yes
30	No
35	No
150	No

Figure 8. Figure of experiment 1

There appears to be a clear threshold between 29 and 30 kilometers where games will no longer be visible. This is not unsurprising, as we set the initial radius to 30 kilometers in the code. The biggest unknown in this part of the project was how precisely the external distance sorting library measured distances. Is the library better at general regions, or precise distances? We determined that, because of the exact cutoff, it is reliable for precise distances. The other factor that we were testing was the accuracy of our code's logic. It does not seem to miss any extremely close games, incorrectly identify games close to the border, or incorrectly include farther away games. This implies that our logic is sound and that our code is functioning properly. This also confirms that there is likely no other part of our code that is incorrectly interfering, such as the filters for skill level or for special-olympics status.

4.2. Experiment 2

ConnACT possesses a special feature of allowing users to rate each other after the games. This will allow other users to get a better idea of how a player will be by just checking his or hers profile. What will happen if users do not rate each other after the game?

First, an imaginary game involving 4 players will be created, so that a user can rate the other three players. For one player, we rate him 5 out of 5, the best rating someone can have. However, for the second one, we don't rate him. For the third player, we rate him 1 out of 5, the worst anyone can have. According to the hypothesis, the first player's average ratings should go up. The second player's average ratings might decrease because he has been to a game without being evaluated. The third one's average ratings should go down.



Figure 9. Figure of experiment 2

Analyze the data. What's the mean and median? What's the lowest value? What's the highest value? What data surprised you or did not meet your expectations? More importantly, why do you think that it turned out that way? What has the biggest effect on your results?

According to our testing, the rating functionality performs mostly as expected. Person 2's rating changed from 3.3 to 2.7 after being given a 1-star rating. Person 3's rating changed from 2 to 2.7 after being given a 5-star rating. These both support our previous predictions for how the application should function and imply that our code is functioning properly. We hypothesized that Person 1 would display a decreased average score if they were not given a rating. However, this does not appear to be the case. This may indicate that we are calculating and saving averages differently than how or when we are expecting to. It is possible that instead of saving all scores from games, we only save the scores that are modified, which would explain the incorrect hypothesis. This could be an indicator of other potential bugs in the rating system, as we did not fully anticipate how it performed.

5. RELATED WORK

My Jump and PowerLift Apps: These apps measure muscular performance and are widely used by sports professionals for training purposes [3]. They are effective in providing accurate data for performance assessment, but they focus on individual fitness rather than facilitating social sports interactions. After all, there are more people playing sports than people who do weight training [4]. ConnACT improves upon this by connecting users with others for group sports activities while also considering skill levels and specific needs. This social function not only promotes a healthier lifestyle but also encouraged people to make new friends and discover more to their lives.

Duatlet: Duatlet is also an app that helps users find sport partners [5]. It allows users to create and join events, similar to ConnACT. While it serves the basic purpose of finding sports partners, Duatlet lacks the comprehensive matchmaking features that ConnACT offers. Duatlet lacks a developed model that evaluates and analyse its users in terms of their sports preferences, skill levels, locations, and medical conditions to recommend the most suitable games. Furthermore, Duatlet has not yet produced a real product on app store. Additionally, ConnACT emphasizes inclusivity by supporting Special Olympics games, ensuring that all users find appropriate and enjoyable activities, which Duatlet does not specifically address.

Tinder: Tinder is a widely known dating app that connects people based on geographical proximity and mutual interest, primarily focusing on romantic relationships [6]. Its matching algorithm shares some similarities to the one of ConnACT's, as they both create a model for each user and help them find their best match. However, while Tinder's algorithm focuses mainly on sexual attractiveness, ConnACT provides a more detailed and nuanced approach to matchmaking, ensuring that users are paired with others of similar abilities and interests, something Tinder does not prioritize. This makes ConnACT more suitable for those looking to engage in physical activities rather than social or romantic encounters.

6. CONCLUSIONS

Nevertheless, the model ConnACT creates for each user has its limitations. Some players might consider themselves to be very good athletes but in reality, they aren't. The same goes for the other way. Some users might underestimate their ability. Self-evaluation of skill levels might not be very reliable [15]. Thus, in the future, ConnACT might utilize the rating system to help facilitate a more accurate evaluation of user's skill. If a certain user reached a high enough

average rating while playing a lot of games in a certain skill level, he or she might get moved up a skill level. On the contrary, if a player reached a low enough average ratings, then the player will get send down a skill level. This way, the good players get to compete with other good players. Users will also be more mindful on their performance on the court, not only enhancing the competitiveness of the game, but also follow good sportsmanship.

ConnACT aims to promote a community of healthy lifestyle and social interactions, where people can enjoy both the fun of sports and making friends. Hopefully, this app can be the start of many athletes' journeys, and also the start of many beautiful friendships.

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