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Enhanced HIIT Based Recommender Application using Collaborative Filtering and Reinforced Learning

Aditya Khursale[1], Ankit Singhaniya[2], Shubham Saykhedkar[3], Swati Shirke[4]

Student, Computer Engineering Department, NBN Sinhgad School of Engineering, Pune, India[1,2,3]

Assistant Professor, Computer Engineering Department, NBN Sinhgad School of Engineering, Pune, India[4]

Abstract: Adaptive High Intensity Interval Training is a mobile application (Android) which helps you stay fit in 7-minutes. This application acts as a workout agent and generate list of exercises for you to perform every day, based on your goals. The user provides these goals as a part of input. The goals can be weight gain, weight loss, cardio, etc. Based on this inputs a workout regime is generated that will help you stay fit wherever you are and in whatever time you have. The advantage of AHIIT is that it does not involve owning any equipment and for sure cuts down the cost of hitting the gym. We also get a tailored, guided and helpful workout based on our personal need without the need of a physical trainer.

Keywords: HIIT (High Intensity Interval Training), Collaborative Filtering, Reinforced Learning, Android Application, Adaptive Fitness.

I. INTRODUCTION

This application provides an interface where user can interact with the app and give his preferences. The application is basically divided into four sections: workout, meditate, track and customize. The workout and meditate are the core functionality of the app whereas track and customize brings together best of all the world including meditations. Short duration of meditations after intense workout help us calm down our body and keep us healthy. Here is a brief description for every section and its functionality. Workout can be performed by used on the move at any location without need of any other equipment. All he needs is his/her body weight. This complete routine will take no more than seven minutes. It is often known as 'The Seven Minutes' workout. User also has opportunity to share his progress on several social media like Facebook, Google+ and Twitter.

II. LITERATURE SURVEY

A. National Institute of Fitness and Sport, Tokyo
They made research on the efficiency of interval training. The procedure involved of 20 seconds of extreme intensity exercise trailed by 10 seconds of break in 8 cycles. After 8 weeks of such schedule, the anaerobic capacity was improved by 28%, whereas the VO2 maximum was improved by 14%.

B. University of Montreal
University has revealed that a 15 second interval of intensive workout is best for the improvement of maximum oxygen capacity in patients with coronary artery disease. HIIT is much enhanced than the old-style aerobic workout without regular changes, because when performed correctly HIIT training fetches about the method recognized as EPOC (Excess Post Exercise Oxygen Consumption), which means an improved oxygen consumption after the training. HIIT is a kind of training in which breaks of maximum intensity swap repeatedly with intervals of moderate or lower intensity.

C. HIIT Research
HIIT stands for High Intensity Training. An intensity can be well-defined as a measurement of prompt ability to do an exercise. It is neither the measurement of maximum weight that can be lifted, nor the weight that is lifted that matters, but an individual feeling of exertion while doing an exercise. The foremost indication of HIIT was totally conflicting to the ideas of mainstream of old-style body building trainings which are very general. Instead of full capacity, variety of movements and numerous schemes of reiteration and circuits, HIT promotes an intensity as a foundation of achieving new great excellence. The prime ideologies of HIT are: spirited exercise, short-term exercise, uncommon exercises and safe training.

III. SYSTEM DESCRIPTION

This section provides insight into the different components of the system. There are total of 4 section in the application. Their interaction and interrelation is explained in the following section.

A. Workout
Workout section is the core of the application with which users will interact in a regular basis and spend most of the time. This section is responsible for accessing the preferences defined by the user in the customization section. Then generate a custom workout routine

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depending on the goals, and reinforced feedback from the individual. The engine to generate the list of workout in the backend currently makes use of test database which compromise of 53+ exercises. They all have a dedicated intensity and parts the cater. This help to identify potential useful workouts. Then a list of all these workout are generated which are displayed on the screen, accompanied by workout music and helpful images. This page will also have a link to YouTube section where every workout can be learned, if needed.

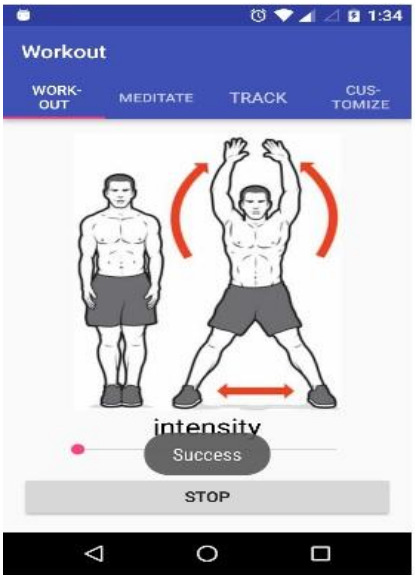

Fig. 1 Workout Module

B. Mediate

Meditate section is an alien to workout world. Workout is all about exercising our muscles, but they forget to include most important of the part, the brain. So we include this and makes a complete workout routine which help you work outyour complete body from the ease of a single application.

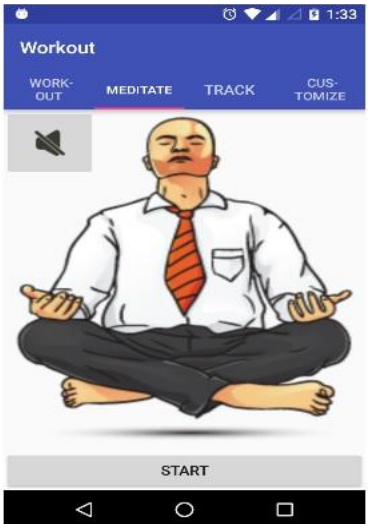

Fig. 2 Mediate Module

C. Track

Track is a feature in our application that gamifies our experience. We see ourselves levelling up as we work hard, or moving down as we slack out. This helps us engage user in a better way thus giving them an opportunity to hit workout goals in a fun way. This page also sports a calendar which shows the days you worked and the days you missed giving you an overall idea of how you are doing. Many people find this feature useful.

Fig. 3 Track Module

D. Customize

Customization is the page where you set your preferences. You define your goals like weight loss, weight gain, flexibility, cardio, etc. We also specify any body parts that we especially want to focus. This helps the application in generating a better workout routine that suits the need of every individual. We can also turn this adaptive feature off in case needed. So that we can easily make it into a normal HIIT application.

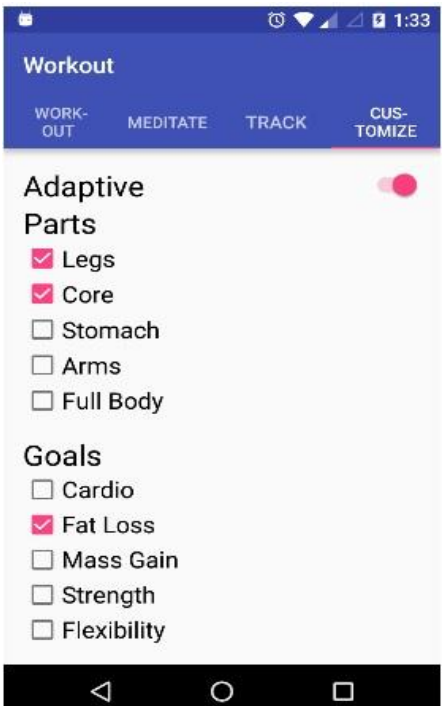

Fig. 4 Customize Module

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IV. METHODOLOGY

In this system we clubbed some elementary techniques of collaborative filtering, probabilistic matching and reinforced learning to improve traditional fitness recommender systems. Parameters like user's health goals, body parts, availability, workout history, ratings etc. are considered for recommendation. All the user's preferences are considered to obtain more user centric recommendation system. The system takes customization from user and this customization is used as basis to obtain suggestions. The specific implementation methodology can be depicted as below.

System is majorly based on probabilistic matching of user's preferences. Reinforced learning is applied with the help of previous rated workouts.

- User's preferences are taken as input from customization tab.
- The database is queried to select matching results for user customization.
- The results are filtered from redundancies by keeping top match as highest priority
- Then weighted sum of intensity match and exercise performed count is considered for further filtration.

Weighted Sum = Perform Count + ((mod (Input Intensity - Predefined Intensity) * Perform Count) / 5)

- Finally, to build user interest previous ratings provided by user are considered as an effective method of reinforcement of results.
- Once, the final set is built, It is recommended in HIIT suggested order to the user.
- User's workout history is mined to find out the most frequent hour on which user is likely to exercise. And, notification is generated on that hour.

V. EXPERIMENTAL RESULTS

TABLE I: RESULT SET FOR VARIOUS CUSTOMIZATIONS

Input Set	Output
Core, Stomach, Fat loss User Intensity 1) 1 2) 2 3) 1	1.[Mountain Climbers, Butt Kicker, Pendulum Swings, Crunches, Frog Jumps, Plank with Side Jumps, Plank Jacks, Pop Squats, Cris Cross Jumps, Stutter Steps, Rear Lunge to Kick, Split Jumps, Jumping Oblique Twist] 2.[Plank, High Knees, Lateral Skaters, Pendulum Swings, Glute Stretch, Crunches, Plank Jacks, Pop Squats, Cris Cross Jumps, Stutter Steps, Toe Touch Jack, Knee to Nose, Abdominal Stretch] 3.[Plank, High Knees, Lateral Skaters, Mountain Climbers, Butt Kicker, Glute Stretch, Frog Jumps, Plank with Side Jumps, Toe Touch Jack, Rear Lunge to Kick, Split Jumps, Jumping Oblique Twist, Abdominal Stretch]
Arms, Full Body, Cardio, Strength User Intensity 1) 1 2) 2 3) 5	1.[Triceps Dips, Butt Kicker, Arm Hauler, Side Knee Tucks, Plank with Side Jumps, Plank Jacks, Pop Squats, Plank Frog Jumps, Downward Dog Push up, Burpees, Diamond Pushups, Hand Walkouts, Knee to Nose] 2.[Triceps Dips, Lateral Skaters, Mountain Climbers, Butt Kicker, Arm Hauler, Side Knee Tucks, Plank Frog Jumps, Downward Dog Pushup, Toe Touch Jack, Rear Lunge to Kick, Split Jumps, Burpees, Hand Walkouts] 3.[Frog Jumps, Plank with Side Jumps, Plank Jacks, Pop Squats, Plank Frog Jumps, Downward Dog Pushup, Toe Touch Jack, Rear Lunge to Kick, Split Jumps, Burpees, Diamond Pushups, Hand Walkouts, Knee to Nose]
Flexibility, Full Body User Intensity 1) 1 2) 3 3) 5	1.[Chest Stretch, Shoulder Stretch, Step-Ups, Arm Hauler, Side Knee Tucks, Triceps Stretch, Biceps Stretch, Side Stretch, QuadricepsStretch, Adductor Stretch, Shoulder Pull, Calf Stretch, Hamstring Stretch] 2.[Chest Stretch, Shoulder Stretch, Step-Ups, High Knees, Triceps Stretch, Biceps Stretch, Side Stretch, QuadricepsStretch, Adductor Stretch, Glute Stretch, Shoulder Pull, Calf Stretch, Hamstring Stretch] 3.[Chest Stretch, Shoulder Stretch, Step-Ups, High Knees, Triceps Stretch, Biceps Stretch, Side Stretch, QuadricepsStretch, Adductor Stretch, Shoulder Pull, Calf Stretch, Hamstring Stretch, Abdominal Stretch]

These are the results from adaptive mode of the application. We can easily see the differences in the result based on our input set, i.e. our goals and intensity. Note: Some exercises will repeat itself due to very high correlation and small dataset. The efficiency and accuracy increases as the size of the dataset increases.

VI. CONCLUSION

HIIT recommender system is made more user centric and adaptive with the help of very rudimentary collaborative filtering and reinforced learning method. But, this small enhancement showed much effective workout schedules and also developed user interest. In future system can be made much more advanced with advanced novel techniques and methodologies.

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