International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-11 Issue-9, August 2022

Sustain our Variable Population Through Differential Evolution Algorithm and Agriculture Innovation

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Abstract: ***Agriculture is a subdivision that provides considerably to the business-related incident of our country. As the world's population grows, Agricultural production has overtaken all other industries as its most significant source of growth. Because the need for food was lower in the 1970's due to a smaller population compared to today's population statistics, that think that the world's public will extend to 9.9 billion by 2050, humanity must plan for agricultural production to feed these exponentially growing numbers. Therefore, we need huge agricultural lands to produce the grains and crops necessary for the current population. But much of the formerly arable land has been abandoned during periods of drought, and due to poor planning and poor water management during the dry season, saving arable land from drought is inevitable. Making a structured plan for water management can be one solution to mitigating large amounts of farmland disappearing. Only 12% of the land can be used for agriculture, but we need to feed 9.9 billion people 70% more food by 2050. That's enough to feed 10 billion people (we're at 7.6 billion right now). Despite this excess, hunger persisted. So we have come up with the Differential Evolution Algorithm, which predicts the future population's food needs based on past and present agricultural data. This helps to solve hunger in the near future and also helps limit drought on land. This study aims to highlight the importance of agricultural information systems for agricultural development, identify the strengths and weaknesses of current systems, and provide recommendations for improving their performance. We will return to the results of previous studies on this issue. Finally, general conclusions about farm information systems are highlighted, suggesting implications for better farm information systems..***

Keywords: ***Agriculture, Differential Evolution Algorithm, population, predict.***

I. INTRODUCTION

In evolutionary computing, differential evolution (DE) is a way of optimizing a trouble via way of means of iteratively looking to enhance a candidate answer relative to a given degree of quality. These techniques are regularly stated as "meta-heuristics" due to the fact they make very little assumptions approximately the hassle to be optimized and might seek very big areas of candidate solutions. The discovered agent-primarily based totally differential evolution set of rules is as compared with 9 famous evolutionary algorithms at this CEC'13 and CEC'17 take a look at sets. As it is today, the world's population grows every day and is estimated at 9.9 billion by 2050. To produce enough food for the billions, we need to increase crop yields. The global populace is expanding nearly every day, but agricultural areas are also getting smaller and smaller for many reasons, such as industrialization, housing and commercial buildings and markets are piling up in an agricultural park. We really have to enhance food production to serve that billion-person populace. It is possible to implement a differential evolution algorithm in the agriculture industry. Among the many variations of evolutionary algorithms (EA), Differential evolution (DE) is one of the maximum authentic because of its extraordinary benefits together with auto-adaptation, ease of perpetration, and only a few manipulate parameters. DE versions were efficaciously implemented to loads of real-global optimization issues and are taken into consideration rather aggressive in the evolutionary computation network because of their overall performance in one-of-a-kind competitions. With differential evolution, people have good health strategies and no future hunger because they can eliminate food waste, predict the present, and produce the amount of food they need in the future. In this concept, agricultural production needs to produce more food in the future and store it for the future population. This is analyzed and estimated for future feeding as the population grows [1].

II. LITERATURE SURVEY

- The Creators J.P. Singh, Rakesh Kumar, M.P. Singh and Prabhat Kumar, established this paper guidance to enhance the crop yield rate by requesting systems of categorization and corresponding of limits. We can likewise resolve and envision crops utilizing Bayesian algorithms. The algorithms secondhand are the Bayesian method, K-means algorithm, clustering method, and support vector machine. The inconvenience is that it doesn't have the right veracity and efficiency.
- The Creators Subhadra Mishra, Debahuti Mishra and Gour Hari Santra, carried out that this is a progressive field of research and endure be extended from now on. The assimilation of informatics accompanying farming helps forecast land harvests.

Manuscript received on 15 July 2022 | Revised Manuscript received on 21 July 2022 | Manuscript Accepted on 15 August 2022 | Manuscript published on 30 August 2022.

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This pattern likewise helps to determine facts about crops and by what method to increase yield rates. Artificial neural networks, decision tree algorithms, and regression analysis algorithms are secondhand. The shortcoming is that the technique is plainly not stated [3].

- The creators E. Manjula and S. Djodiltachoumy, decided that the intentions concerning this paper search out suggest and they implement a rule-located structure. And anticipate crop yields from past data accumulation. The algorithms secondhand are K-method algorithm, a clustering technique. The limitation is that the purpose of association rules is simply applicable and less data is studied [4].
- The Creators T. Giri Babu, Dr.G. Anjan Babu, include achieved that this procedure will determine explanations to the cultivators. They can further help determine a resolution to the water and fertilizer difficulties. And this supports accompany a more effective result. The techniques secondhand are agro-algorithms. The inconvenience is that this arrangement doesn't determine sufficient veracity for the yield [5].
- The Creators Ashwani Kumar Kushwaha, SwetaBhattachrya achieves that this procedure determines an agro algorithm that helps forecast appropriate yields for the area. And this support to boost the characteristic of the yield. The method used is the agro algorithm. The loss is that the harvest is complicated to forecast [6].
- The Creators Anshal Savla, Himtanaya Bhadada, Vatsa Joshi, in addition Parul Dhawan, have achieved that this pattern will cooperation to evaluate and learn yield harvest rates for areas with established characteristics. The algorithms secondhand are normalization, clustering, as well as classification. The inconvenience is that it's only for frames.
- The Creators Siti Khairunniza-Bejo, Samihah Mustaffha, Wan Ishak Wan Ismail, decide that the design will support determining a resolution to a few farmers' complications in order to achieve useful yields. The methods secondhand are artificial neural networks, and this method takes additional period.

III. EXISTING SYSTEM

The globe populace be necessary to increment from 7.8 billion in 2020 to 9.9 billion in 2050. This level pretends a 25% increment through 2020. By 2050, we should have delivered 70% more food due to population growth. Every year, agriculture produces 12% of all greenhouse gas emissions. Around 80% of the developing world is prod. They are responsible for analyzing and calculating the district's educational schemes, establishing zoning lines, holding public hearings on particular issues, and more. They are appointed by state legislators. And we are the Community Education Council 17, serving a diverse and prosperous community, including Crown Heights. The existing system does not use powerful algorithms to predict the food productivity of the upcoming population, but the above council agencies and other agricultural agencies around the world have reached an agreement. So the above stated our bodies are essentially treated via way of means of human labor and intelligent, this could create a human blunders that can result in a catastrophe had been our destiny era might also additionally starve in destiny. CEC13 has limitations such as limited resources, opportunity cost, organizational priorities, legality and regulation, and organizational objectives.

IV. MATH

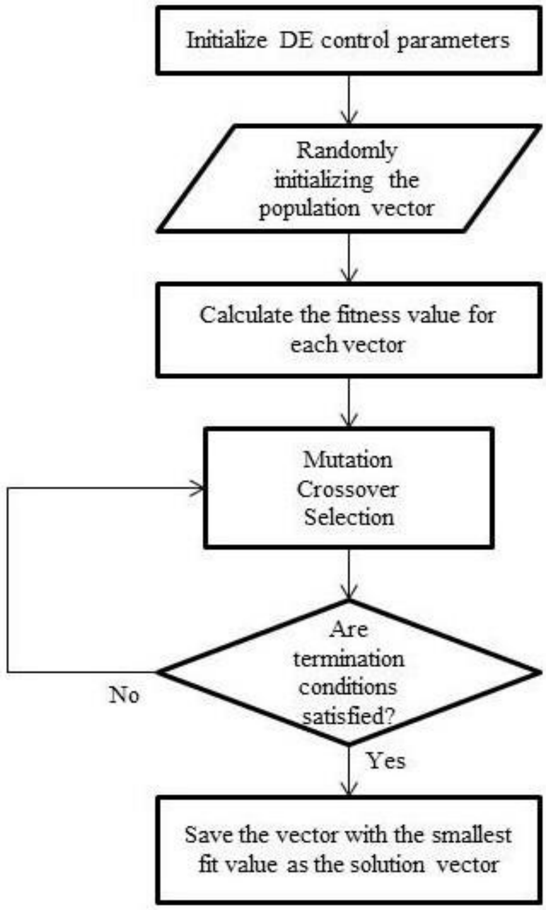

Fig. 1. Process Chart of the Research Project

Differential Evolution (DE) is a populace-based, random, evolutionary optimization algorithm. Fig.1 displays the organization chart of DE. Differential Evolution uses three evolutionary procedures, similar to mutation, crossover, and selection to find the optimum result from a randomly produced offset populace [2].

A. Mutation

DE is distinguished from other evolutionary algorithms by its mutation operator. The purpose of the mutation is to make alterations to some genes in the current individual at random rates. The individual's solution point advances a specified distance in the solution space.

It is vital to establish the adjustments that will provide the proper direction and quantity of movement in order to achieve the aim of this procedure. In every generation, the mutation technique starts with the choice of three individuals from the populace at random. The most regularly used mutation techniques applied within the distinct evolutionary codes are given in equations (1-5).

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-11 Issue-9, August 2022

DE/rand/1: $V_{i,g}=X_{r1,g}+F^*(X_{r2,g}-X_{r3,g})$ (1)
DE/rand/2: $V_{i,g}=X_{r1,g}+F^*(X_{r2,g}-X_{r3,g})+F^*(X_{r4,g}-X_{r5,g})$ (2)
DE/best/1: $V_{i,g}=X_{best,g}+F^*(X_{r1,g}-X_{r2,g})$ (3)
DE/best/2: $V_{i,g}=X_{best,g}+F^*(X_{r1,g}-X_{r2,g})+F^*(X_{r3,g}-X_{r4,g})$ (4)
DE/rand-to-best/1: $V_{i,g}=X_{r1,g}+F^*(X_{best,g}-X_{r2,g})+F^*(X_{r3,g}-X_{r4,g})$ (5)

NP describes population count, $i = 1,. . . , NP$, $r1, r2, r3 \in [1,. . . , NP]$ are preferred at random. In addition, $r1 \neq r2 \neq r3 \neq i$, moreover $F \in [0, 1]$ are preferred mutation scale parameters.

B. Crossover

When performing crossover processing, an individual candidate ($U_{i,G+1}$) is created for the new generation by using individual differences ($V_{i,G}$) obtained from existing mutations and individuals ($X_{i,G}$). When the candidate test instance is generated, every candidate individual gene is extracted with the possibility of CR from the distinct individual and with the possibility of 1 – CR from the current instance. The crossover operator is given in equation (6).

$$U_{j,i,G+1}=\begin{cases} V_{j,i,G+1} & \text{if } rand_j \leq CR \vee j=k \\ X_{j,i,G+1} & \text{otherwise} \end{cases} \quad (6)$$

In the equation (6), $j = 1 .. n$, $k \in [1,. . . , n]$ is a random limit index, selected formerly per i. This value is user-determined using the control parameter $CR \in [0, 1]$.

C. Selection

The DE selection scheme isn't the same as different evolutionary algorithms. For future generations, the populace will be selected from individuals in the ongoing population and from specific trial vectors in accordance with the current rules. The selection operator is given in equation (7).

$$X_{i,G+1}=\begin{cases} U_{i,G+1} & \text{if } f(U_{i,G+1}) \leq f(X_{i,G}) \\ X_{i,G} \ \& & \text{otherwise} \end{cases} \quad (7)$$

V. PROPOSED SYSTEM

We proposed evolutionary algorithm (EA) variations, Differential Evolution (DE) is one of most important prestigious because of its distinct blessings, which include computerized adaptation, clean implementation, and only a few manageable parameters. DE variations were efficiently implemented to lots of real-global optimization troubles and are taken into consideration highly competitive in the evolutionary computation community, depending on their overall performance in distinct competitions. Differential evolution (DE) is a population-based meta-heuristic optimization strategy that optimizes difficulties through frequently improving candidate resolutions based on the evolutionary process. Similar algorithms can quickly find a veritably massive scheme space with little or no assumptions about the underpinning optimization problem. In this recommendation system, we collect information about culture or agricultural culture from the past to present. Differential evolution algorithms use past and present data to help predict the amount of food that a population needs to grow by 2050. Finally, through proper planning and management, the extinction of agricultural land can be mitigated. The above proposed model creates a food supply chain which helps to reduce food wastage and also starvation.

We collect data sets from different sources and store these data sets in a database. The process is implemented after getting the information from the available dataset and checking it manually. After processing the dataset, we implement a differential evolution algorithm to predict the amount of food that will need to be grown for the population by the year 2050. In Fig. 2, the whole process is illustrated.

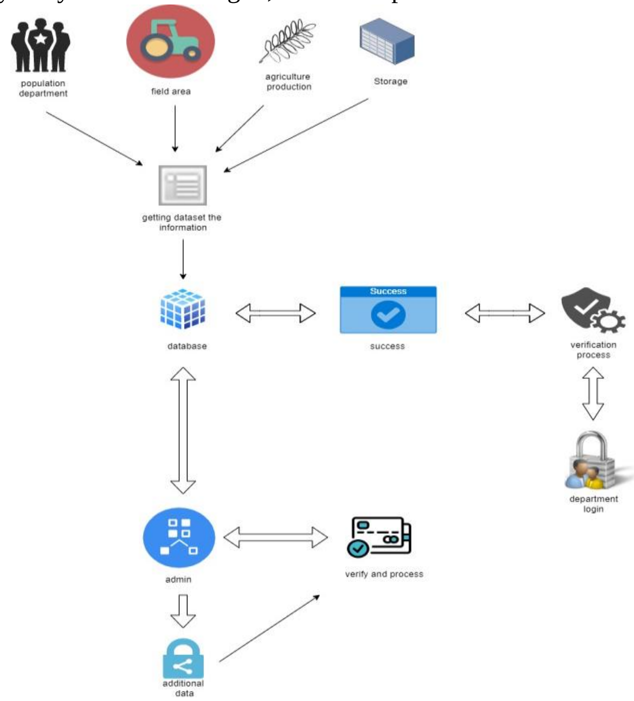

Fig. 2. An Architectural Diagram of the Proposed System

VI. ADVANTAGES

A. Figures and Tables

The main advantage of differential evolution is that there are no major constraints on the error function.

- DE finds the accurate global minimum, regardless of the original parameter value, rapid convergence, and the number of manage parameters used.
- A small quantity of specific mathematical understanding is required to use evolutionary algorithms in differential evolution.
- Differential Evolution Algorithm is extremely flexible and is a great alternative for problems without traditional best-practice methods.
- Suitable for successfully resolving NP-hard problems.
- Differential Evolution is about simplicity, efficiency, real coding, Ease of use, local search capabilities, and speed.

VII. CONCLUSION AND FUTURE ENHANCEMENT

By 2050, the globe's populace will reach 9.9 billion, 34 percent greater than it is today. Almost all of the population growth is occurring in developing countries. Urbanization is progressing rapidly, with about 70 percent of the globe's population residing in cities (up from the current 49 percent).

Annual grain productions will growth from the present 2.1 billion tons to around 3 billion tons, and annual meat production will increment by greater than 200 million tons to 470 million tons. Currently, there are approximately 2.7 billion hectares of land around the world with potential for crop production. This paper argues that the necessary increase in food production can be achieved if the necessary investments are made and policies are put in place to facilitate agricultural production. Thus, our proposed differential evolution algorithm helps to irradiate the problem of starvation in 2050. In the future, deep learning models will be available for crop prediction. The most commonly used algorithm for deep learning models is neural networks, which gives the best results with accurate values. This could help prevent future populations from starving to death.

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