Published by The College of Science & Information Technology (COSIT), TASUED, Vol. 19, No. 1, pp. 34-42.

COSIT, TASUED
Journal of Science and Information Technology (JOSIT)

Development of Herbarium for E Medicine using Binary Tree Search Algorithm (BTSA)

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Abstract

The globalization age enables assessing the exchangeability of treatments between different cultures is not a relevant goal for clinical herbal research, but the assessment of herbal efficacy and safety that should be based on the regular patterns of mainstream clinical medicine. Many research has been done in the manufacture of different Curable Illicit Medicine (CIM) in recent time, but this (CIM) has its own demerit such as psychosis disorder, However Herbal-Derived Remedies (HDR) need a powerful and deep assessment of their pharmacological qualities and safety issues due to the large and growing use of natural derived substances all over the world. It use for medicinal plants for prevention and treatment of diseases ranges from traditional and popular medicines, with the use of standardized and titrated herbal extracts. Model knowledge, engineering E-medicine herb process with consolidated information about their application to cure certain diseases and prescription method was adopted .The explanatory and pragmatic herbarium studies are useful and considered complementary in the acquisition of reliable data both for health caregiver and patients. In this research work, a critical study of herbarium for E- Medicine was developed, highly examined, assessed and provides E Medicine solution to the different ailments. The characteristics distribution of different herbs were studied, coded and stored in the herbarium database and using the C++ language with the BTSA model which maps out command interface, the system proved to be reliable and efficient when adapted to client's patients.

Keywords: E-medicine, Herbarium, Binary tree search algorithm, Command interface

INTRODUCTION

The background study of herbal Plants had been used for medicinal purposes long before recorded history. Ancient Chinese and Egyptian papyrus writings describe medicinal plant uses as an indigenous culture such as African and Native American used herbs in their healing rituals, while others developed traditional medical systems in which herbal therapies were used systematically cite. The Botanic Garden was founded in 1826 under Dutch rule by the Royal Society for Horticulture & Arboriculture of the Netherlands. However, it had a faltering start. In September 1830 revolution broke out in Brussels and the Director moved to Leiden in the Netherlands with his precious Asian specimens. As a result, Belgium emerged

Cite as:

Olatunbosun, L. O.; Akinyemi, O. S.; Usman, O. L.; Logunleko, B. K. (2025). Development of Herbarium for E Medicine using Binary Tree Search Algorithm (BTSA). *Journal of Science and Information Technology (JOSIT),* Vol. 19, No. 1, pp. 34-42.

without a national herbarium. Gradually, the botanical gardens bought, inherited or were given many notable herbarium collections. Amongst them was the Brazilian Herbarium of Claussen, a collection of vouchers by Dr. Fifechet from Africa and others collected in Japan by C. L. Blume. A most impressive collection was purchased from the widow of Henri Galeotti a geologist and botanist. (1814-1858 cite. He was hired to extensively

Collecting 7,297 specimens of which 4,620 were deposited in the Brussels herbarium. The garden was originally set up by a number of wealthy citizens as a Joint-Stock company, In developing countries particularly West Africa, as much as 80 percent of the indigenous population still depends on traditional systems of medicine and medicinal plants for healthcare cite. Widespread use of herbal medicines has raised questions about their quality, safety and efficacy. As part of dealing with immense strategy, extensive task of reviewing the country' scientific literature of commonly used herbal medicines have conducted to promote global harmonization of herbal health care cite.

There is indeed a necessity in making life better by introducing E-Medicine associated with natural herbal dietary supplements in the society which facilitate herbal preparation, diagnosis and treatment of various deseases. Within the past decade, herbal medicine has gained increasing importance, with both medical and economic implications.

RELATED WORKS

The beginning of herbarium as a collection of dried specimens affixed to paper for a lasting record is attributed to Luca Ghini (1490-1556). According to Allen J.B, (2023) .Ghini seems to have been the sole initiator of the art of herbarium-making and this art was disseminated over Europe by his students Cibo. Gherards a pupil of Ghini, began collecting and preserving specimens as early as 1532 and his herbarium is extant today. John Falconer, an Englishman, is mentioned as possessing herbarium in the writings of Lusitanus in 1553 and William Turner in 1569, and it is believed that he also learned of herbarium making either directly or indirectly from Ghini (Allen, 2023)**.** In the United States several herbaria are known to have existed in the mid 1700's. Many of these and later ones found their way to Europe, where they are preserved. (Kastner and Lanjouw.2019). and Crum (2021) the oldest institutional herbarium in the United States is that of Salem College started in 1772. Other early institutions include the Academy of Natural Science in Philadelphia, Amherst College, Boston Society of Natural History, Charleston Museum, and others, all founded before 1860 (Savile and Meadows, 2023).

According to Bentham and Hooker (2015), this system is rarely used in the United States for a list of larger European herbaria using this system.

Dalla Torre and Harms: Numerical arrangement of the Englerian System**;** A common system in the United States and other countries often modified so that only family sequence is followed with general and species being alphabetically arranged. Dalla Torre, and Harms, (2000-2007) new edition ***Alphabetical***: This system is adopted in this work and varies from strictly alphabetical by family, then genus, species, to some modified system e.g., segregation of ferns, gymnosperms, monocotyledons, di cotyledons, with alphabetical arrangement of families in each of these groups.

E-MEDICINE

This was originally conceived in 1996 as an emergency medicine textbook but its content has expanded considerably since then to include allergy and immunology, cardiology, clinical, critical care, dermatology, emergency medicine, endocrinology,. Genomic medicine, hematology, infectious diseases, neurology, obstetrics and gynecology, oncology, pathology, perioperative care, physical medicine and rehabilitation, psychiatry, pulmonology , radiology, rheumatology, and sports medicine. (MRC 2017).

Herb Combining: Often several different herbs are used together. Practitioners engage the principles of synergy and buffering apply to combinations of plants and claim that combining herbs improves efficacy and reduces adverse effect. This contrasts with conventional practice, where poly pharmacy is generally avoided whenever possible

THE RESEARCH SIGNIFICANCE (RS) OF THE HERBARIA SCHEEME

1. **Basic Functions and Research:** The provision of data for floristic studies; serve as a repository of new collections; provide data for revisions and monographs; verify plant Latin names, Common names and Local names with other nomenclature; serve as a secure repository for type specimens; provide infrastructure for obtaining loans etc. of research material; facilitate and promote the exchange of new material among institutions; provide material for DNA analysis in systematics, evolution, genetics; provide information for GIS studies of past and future collecting expeditions; house vouchers for photographs that can be used in lectures, web sites, and publications ; provide information on rare, extirpated, or extinct species that can no longer be found in nature conservation biology; provide modern specimens for comparisons with fossils e.g. classification of leaf patterns; pale botany; to trace the history of usage of binomials for a given taxon in a given local flora area

2. **Collections of Related biological research:** Provide material for microscopic observations as in the anatomy and morphology; document the morphology and anatomy of individuals of a particular species in different locations in different environmental variation, and medical studies; provide reference samples for the identification of plants eaten by animals such as animal ecology. To determine native ranges and document which plants grew where through time invasive species, climate change, habitat destruction, etc. document what plants grew with what other plants phytogeography, ecology; Serve as a repository for voucher specimens ecology, ethno botany, environmental impact studies provide material for chemical analysis lead-uptake; pollution documentation; bio-prospecting ,for coralline algae-determining past ocean Temperatures and chemical concentration; provide information for studies of expeditions and explorers in the history of science; provide the label data and field notebooks necessary for accurate data basing of specimens in biodiversity and conservation biology, biogeography. Serve as a reference library for the identification of parts of plants e.g., seeds found in archeology digs km i.e. Pale ethno botany; provide context for accompanying library and other bibliographic resources library sciences, general research, taxonomy; serve s an archive for related material in field notebooks, letters, reprints, etc.; Provision of information on common names and local uses of plants anthropology, linguistics, ethno botany, economic botany; provide information on plant predators e.g. Leaf miners, leaf-cuter ants; entomology, ecology; provide information for foliar physiognomy studies of leaf form as it is related to climate change paleoecology.

3. **Education and Training:** Provide material for teaching bioinformatics, botany, taxonomy, field botany, plant communities; ethno botany; agriculture; dendrology, forestry; promote appreciation of botanical diversity by making specimens available for viewing by students, researchers, and the public. Expose students to systematic research; train local volunteers for specimen handling, scanning, and data basing etc.; run education courses for the public e.g. local plant families.

PROPAGATION OF THE (BTS) SEARCH ALGORITHM

Binary Search Tree: (BST) are a fundamental data structure used to construct more abstract data structures such as sets, multi sets, and associative arrays used in work and the tree search only applicable if the data fits into a tree structure. The database starts at a root that goes to a few items, each of which goes to a few more items and so on until you have a tree. BST algorithm uses large

databases with records ordered by numerical key e.g. herbs we included the herbaria database keyed by their ecological number name, and the Herbarium Specimen Preservation (HSP) stored in museum data base. The algorithm starts at the middle of the database if your target number is greater than the middle number, the search will continue with the upper half of the database. If your target number is smaller than the middle number, the search will continue with the lower half of the database. It keeps repeating this process, cutting the database in half each time until it finds the record.

ISSUES IN BINARY TREE SEARCH

Issues in binary tree search in an abstract model of its form and support three main operations: **insertion** of keys, **deletion** of keys, and lookup i.e. **checking** whether a key is present. Each requires a comparator, a subroutine that computes the total order i.e. linear order on any two keys. This comparator can be explicitly or implicitly defined, depending on the language in which the BST was implemented with common comparator, the less than function

For

a <, where a and b are keys of two nodes

a and b in a BST**:**

1. Searching:

A BST for a herb specific key is a recursive iterative process which begins by examining the root node. If the tree is null, the key we are searching for does not exist in the tree. Otherwise, if the key equals that of the root, the search is successful and we return the node. If the key is less than that of the root, we search the left sub tree. Similarly, if the key is greater than that of the root, we search the right sub tree. This process is repeated until the key is found or the remaining sub tree is null. If the searched key is not found before a null sub tree is reached, then the item must not be present in the tree. This is easily expressed as a recursive algorithm.

2. Insertion:

This begins as a search would begin; if the key is not equal to that of the root, we search the left or right sub trees as before. Eventually, we will reach an external node and add the new key-value pair which is encoded as a record new node as its right or left child, depending on the node's key. In other words, examine the root and recursively insert the new node to the left sub tree if its key is less than that of the root, or the right sub tree if its key is greater than or equal to the root.

3. Deletion:

Three possible cases was taken into to consideration, these include:

i. Deleting a node i.e. herbal classification name with no children: simply remove the node from the tree.
ii. Deleting a node with one child: remove the node and replace it with its child.
iii. Deleting a node with two children: call the node to be deleted N. Do not delete N. Instead, choose either its in-order successor node or its in-order predecessor node, R.

Copy the value of R to N, then recursively call delete on R until reaching one of the first two cases.

4. Traversal:

The initial creation of BST in-order enables its elements retrieval by recursively traversing the left sub tree of the root node, accessing the node itself, then recursively traversing the right sub tree of the node, Continuing this pattern with each node in the tree as its recursively accessed which result in a sorted list of node items numbers, strings and other comparable herb items.

As with all binary trees, one may conduct a pre-order traversal or a post order traversal, but neither are likely to be useful for binary search trees. An in-order traversal of a binary search tree will always result in a sorted list of node items numbers, strings or other comparable items.

MATERIALS AND METHOD

This involves the herbarium design frame work, the population study distribution, collection and abstract procedure used in the data analysis. The complete analysis and evaluation of the herbarium plant database for the knowledge-based assessment. Broad propagation of BSTA for the implementation in the herbarium data base.

The BST Propagation algorithm:

Let A be an array of herbarium data speci men of n elements A [1], A [2], A [3] ...A[n].

Herbarium Data specimen is an element to be searched

With mid: middle location of a

segment array AND sub array of the ele ment of A.

LB and UB: Lower and upper bound of the arr ay under

study.

1: Input an array of herbarium data speci men of n el ements AND sorte d order considerati on.

// define the Data specimen boundary

2: LB=0;

3: UB=n;

4: Mid=inf((LB+UB)/2)

5: Repeat step 6 and 7 while (LB<=UB) and (A[mind]!=data)

6. If (data < A[minid]) UB = mini d-1

Else

7: LB = mind+1

8: Mid=inf((CB+UB)/2)

9: If (A[mind]=data)

10: Display the data found:

Else

11: Display the data is not found

12: Exit

13: Evaluate Insertion field from the file

14: Def.binary_tree_insert (node, key, val ue):

15: If node is none:
Return

16: Tree Node (None, key,value,none)

17: If key=node. Key
Return

18: Tree Node (node. Left, key, value, no de. Right)

19: If key <node. Key:
Return

20: Tree Node {binary_tree_insert (node .Left, key, value), node. Key, node. Va lue ,node.Right)

Else:
Return
(value)

21: Tree Node (node. Left, node. Key, no de. Value, binary_ tree_insert (node.ri ght, key)

22: Stop

23: End

The designed propagation method above c heck to see if the tree (list of medicinal herbs) already has a root. If there is not, a root then P ut will create a new Tree Node and install it as the root of the tree.

If a root node is already in place then Put c alls the private, recursive, helper function Put to search the tree in accordance to the beignet algorithm:

Starting at the root of the tree, in the herba rium database

1. Search the binary tree comparing the n ew key to the key in the current node.
2. If the new key is less than the current node,
3. Search the left sub tree.
4. If the new key is greater than the curre nt node, search the right sub tree.

5. When there is no left or right child to s earch, then position in the tree is foun d where the new node should be instal led.
6. To add a node to the tree,
7. create a new Tree Node object and ins ert the
8. Object at the point discovered in the p revious step.
9. The Process of Construction requires that:
10. A key x from the keys is selected unif ormly at
11. Random and is inserted to the tree.
12. Then all the other keys are inserted. H ere all the keys greater than x go into the right sub tree of x and all the keys smaller than x go into the left sub tree .
13. Thus, the height of the tree thus const ructed is
14. one plus the larger of the height of th e left subtree.
15. And the height of the right sub tree

ORAL HERBAL MEDICINE AND DIAGNOSIS: (OHMD)

The wide spread use of herbal medicine is not limited to developing countries, as an estimate of 75% of all medical doctors in German ,France and Spain regularly prescribe herbal medicine (Murray and Pizzorno, 2024). The number of patients seeking herbal approaches for therapy is also growing exponentially (Alschuler et al.,2017) with the US Food and Drug Administration (FDA) relaxing guidelines for the sale of herbal supplement (Gottlieb, 2020), the market is booming with herbal products (Brevoort, 2018). Herbal practitioners use different diagnostic principles from conventional practitioners. They do A diuretic with laxative combination of herbs which then prescribed together with anti-inflammatory herbs properties.. By taking a complete drug and supplement history, a dialogue can be initiated to rationally compare the appropriateness of herbal remedies and regulated pharmaceuticals in relation to the severity of the condition.

DEMERIT ISSUE ON E MEDICINE HERBAL MISINFORMATION

Misinformation based on hope without clear fact, (Tyler, 2009). Most sites merely list herbs and their uses few mention regulation, safety, or efficacy. Even an herb with well-structured toxicities have but without cautionary statement (Winslow and Kroll, 2018). Also Most herbal medicine producers are still relatively ignorantly lack precise administration with the necessity of adequate dosage leading to many erroneous results have appeared in the medical literature because the clinicians accept at face value the quality of an herb that was adulterated, Failure to identify specifically by scientific botanical names in the product tested, and the precise dosage administered (Scuppan et al., 1999).

ARCHITECTURE FRAMEWORK

The architecture frame work of this application for herbal medicine prescription on communicable and non-communicable cyclic disease is presented in **figure one.**

The architecture framework define the component of the develop system together with the interactions between each component. During design stage, the architecture of the system was developed taking into account the constraints imposed by the user requirement and the available technology. The compliant of the framework are explained is follows:

1. **Application Device**: Use lunch the application on their device. This enables the user to select the list of observable herbaria and view to select from options.
2. **Interface layer**: This is the larger for interacting with the system. The system provides the result through the application interface. User selects from the options menu through the user interface, which consequently calls the knowledge base, feeding the user input data, the knowledge base in bearing consulted then the inference engine comes to a final herbal descriptive diagnosis which is displayed by the command user interface to the user.

3. **Knowledge representation layer**: This provides knowledge about problem description associated among these concepts, and constraints on the concepts and associations.
4. **Knowledge Base**: Knowledge base consists of some encoding of the domains of expertise for the system. This can be in the sum of sematic nets, procedural representation, production rules or frames. They rules occurs in sequence when the rules are examined by the inference and actions are executed if the information supplies by the user satisfies the conditions in the rules.
5. **Inference Engine**: Inference engine is the dialogue conducted by the user interface between the user and the system. The user provides information about the problem to be solved and the system them attempts to provide insights derived or inferred from the knowledge base. These insight are provides by the inference engine after examining the knowledge base.
6. **Database server**: Database server is a foundational part of the system. It is also called the working storage; it works hand in hand in with both the knowledge base and the inference engine as a means of data storage. It stores all important and detailed information about the Herbal Medications.

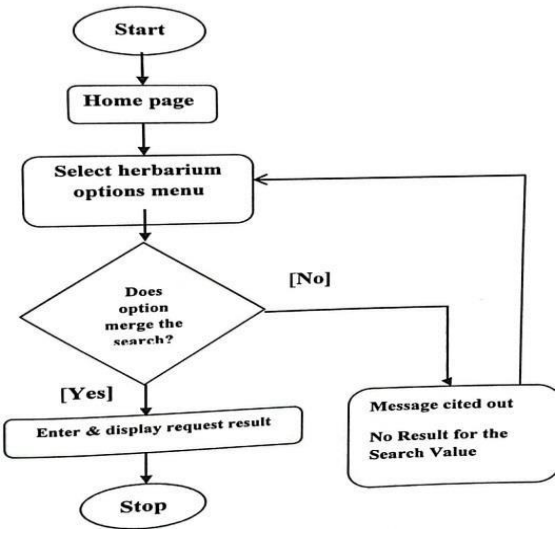

Figure1. Flowchart of the command menu user interface.

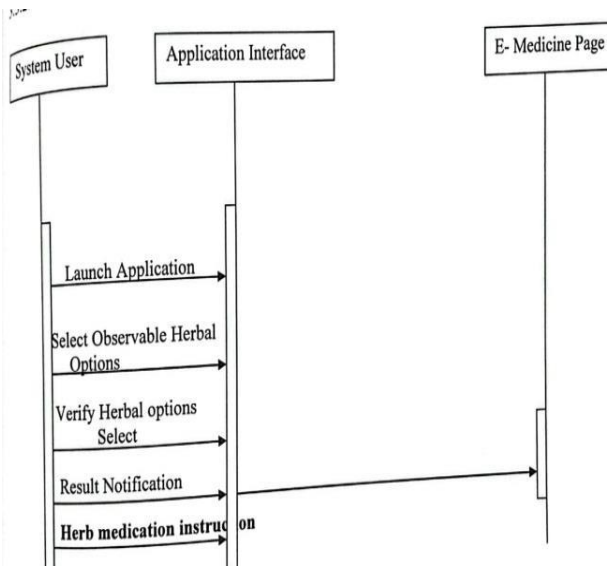

Figure 2. Sequence diagram of the system developed.

IMPLEMENTATION AND TESTING COMMAND USER INTERFACE (CUI) OF THE E-MEDICINE HERBARIUM SYSTEM

It shows the CUI of how users aim to enter their Options from the option table menu after which the system instructed and provides the medicated result (i.e. the herb preparations to be used, the ecological distribution, the medicinal value that produced it and where to obtain the herb). It process some like:

1. **Enter**: is the button for evoking the menu options selected by the user in other to obtain the desired result.
2. **New Table Menu:** This is shown after user enters a numeric value from the command interface. This button allows users to select from other sub menu options among the list.
3. **Exit**: exit user from the application by selecting numeric key pad 5.

Figure 3. Command Table Menu interface.

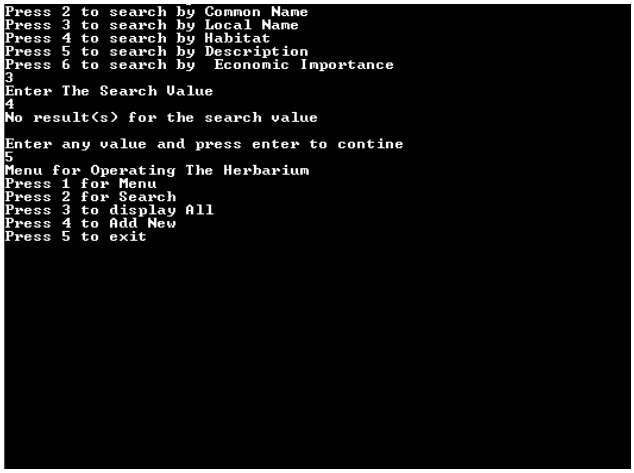

Figure 4. New Table Menu.

SUMMARY AND CONCLUSION

This work focuses on implementing a thick application on herbarium E-medicine prescription for. Communicable and non-communicable diseases It will be a greater task for peoples whose environment are for a medical Centre and those who can't avoid visiting the medical Centre.

As pervasive technologies become a more integral part of everyday life; attention is now being paid to how this ambiguous compiling system can be used to monitor and contribute to herbal health care service. This project develops herbarium E-medicine with their medicinal production capacity where it can be found and cure related

RECOMMENDATION AND FUTURE WORKS

This application the E-medicine herbal prescription on diseases is highly recommended to:

1. Help user to get alternative ridge their ailment with ease.
2. Ensure first aid treatment to user.
3. As a pivot publication for use with other similar thesis as may be required in the nearest future.

This developed application for herbal E medicine prescription for varying degree of diseases where users can launch the application, select observable options and get a prescription result.

In the future, the implementation can be done in such a way that the user enters their symptoms to diagnosed result, which will be more efficient and reliable.

REFERENCES

.

Allen J.B, Schnyer R.H, (2023). The efficacy of acupuncture in the treatment of major depression in women. Psychologizing Sci; vol.9 Pg 397.

Alschuler L, Benjamin SA, Duke JA (2017). Herbal medicine - what works, what is safe. Patient Care, 31, 48-103.

Anita S. *et al* (2019) An Overview on Herbal Medicine https://www.researchgate.net/publicationAn Overview on Herbal Medicine

Barnes L.L. (2018) The psychologizing of Chinese healing practices in the United States. Cult Med Psychiatry Pg 413-43.

Bourin, M.,& Bougerol, T.,. (2017). A combination of plant extracts in the treatment of outpatients with adjustment disorder with anxious mood: Fundamental, 11,127-132.

Bowles J.M. (2016). The collecting scroll: a practical alternative to the field press. The Plant Press 4:74-75.

Bhatt AD and Bhatt NS (2016). Indigenous drugs and liver disease.Indian J Gastroenterol, 15, 63-7.

Boullata JI and Nace AM (2020). Safety issues with herbal medicine. Pharmacotherapy, 20, 257-69.

Brevoort P (2018). The booming US botanical market. A new overview. Herbal Gram, 44, 33-44.

Carter AJ (2009). Dwale: an anesthetic from old England. BMJ,319, 1623-6.

Chattopadhyay MK (2016). Herbal medicines. Current Science,71, 5

Chattopadhyay MK (2017). Herbal medicine - some more reports.Current Science, 72, 6

Cardini F & Wade C, (2021). Clinical research in traditional medicine: priorities and methods. Pg.282-87.

Chavan P,Joshi K,Patwardhan B. (2016) DNA Microarrays in Herbal Drug Research. Evid. Based Complement. Alternative Med. 3:Pg. 447-57.

Crum, H. (2021). Mosses of the Great Lakes forest. University Herbarium, Ann Arbor, Michigan.pp. 404.

Darbinyan, V. *et al*. (2017). Clinical trial of Rhodiola rosea L.extract SHR-5 in the treatment of mild to moderate depression. Nordic Journal of Psychiatry,61,343-348.

Dwyer, A., Whitened. & Hawrelak, J. (2021). Herbal medicines, for the treatment of depression. An alternative Medicine Review,16, Pg 40-49.

Kastner,J.(2019). A world of naturalists. John Murray, London. Pp. 350

Medical Research Council (MRC) (2017) A framework for development and evaluation of RCTs for complex interventions to improve health.

Harper & Row (2008) New York. 891 pp. What are pragmatic trials? BMJ. 316:285 Savile, D.B.O. (2023). Collection and care of botanical specimens. New Edition. Agriculture Canada, Research Branch, Publication 113.128 pp.

Tandon B.N,Tandon HD, Tandon R.K, Narndranathan M, Joshi YK.(2016) An epidemic of hepatic veno-occlusive disease in central India. Lancet 2016; 2:271-2