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A Web Based Web services Information System Using Cloud Computing

Mohammad, Amin, Roshanasan

Assistant Professor electric power engineering in University, Nigeria,

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Corresponding Author:

Mohammad, Amin, Roshanasan

Abstract— Cloud Computing is the new field that was invented and developed during a period not so long ago. It has a lot of benefit such as decreasing the cost that the user needs, process the operation faster and keep the information secure. The security of cloud is the most important issue for several sensitive occupations, for web base information using this kind of computing does not need more than a computer and high speed internet to use application which is developed by cloud computing. This paper presents a model of web based information system at Amazon Web Services using visual studio to build a website with cloud data service which takes data from the instance in EC2 on Amazon Web Services (AWS), then lets AWS host data services from the cloud. The environment used, is EC2 (Elastic Cloud Computing) on AWS (Amazon Web Services) as host for an application which has several services to allow each user use the application separately and securely. AWS configuration and the way of using virtual server which its given by EC2 will be pointed out in this paper..

Keywords: ***Web Page Optimization, Clustered Query Sessions, Effective Information Retrieval***

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I. INTRODUCTION

Information on the web is huge in size and growing continuously hence it is a big challenge to identify the relevant web pages for a specific information need of the user. Research has been done for better personalizing the web search of the user using various techniques. [4][15] [20] [69] [14] [63] [12] [34] [68] [64] [50][49] [38] [51] [52] [53][54] [55][37]. It is found that hybrid of optimization technique Ant Colony Optimization (ACO) and trust have been applied successfully in various domains and results proved promising. In [65] ACO algorithm is adopted in trust model in order to simulate trust relationship between cloud entities in cloud computing. In [22] trust evaluation model is developed in P2P networks. In [5] ant algorithms have been applied to estimate the degree of trust between nodes in mobile adhoc networks. In [56] ACO algorithm has been used for reaching optimality in grid scheduling problem. In [10] a hybrid of ant colony system for predicting the recommendations in trust based recommender system is proposed which considers all the target item ratings along the solution path rather than just stopping and using the first rating found in the search process. In [59] a optimized and trusted routing in MANET is proposed where nodes with trust value above the threshold value are considered for routing and finally optimization is done using ACO to yield more optimized performance. It is found that hybrid of ACO and trust shows promising results in various domains but it is realized in this research that benefit of this hybrid can be used in query log mining for web page optimization in a given domain in order to identify relevant documents for effective web information retrieval. Thus in this paper hybrid of ACO and trust has been proposed for web page optimization using clustered query sessions. The significance of using hybrid of Trust with ACO is that use of trusted web pages for optimization will increase the quality of colonies of web pages identified using ACO and will identify

the web pages relevant to the information need of the user in a given domain. These trusted colonies of web pages in a specific domain when selected for recommendations will retrieve more and more relevant documents and improve the precision of search results. Thus user response to trusted web pages is captured to update the trust and pheromone of clusters and is used for identifying more and more trusted colonies of web pages for further recommendations. This process of recommendations and optimization continues till the web search is personalized to the information need of the user. Since the ratio of relevant documents to retrieved documents is increased hence web search will soon converge to information need of the user effectively. The flowchart of the proposed work is shown below in Fig 1.

Experiment was conducted on the data set of web search query sessions captured in three domains Academics, Enter-tainment and Sports and the results confirms the improvement in the precision of search results. The rest of sections are or-ganized as follows. section 2 discusses the related work, sec-tion 3 describes the background required for understanding the proposed approach, section 4 explains the proposed ap-proach of Domainwise web page optimization using hybrid of trust and ACO for effective

Information Retrieval, section 5 presents the experimental study to analyze the effectiveness proposed approach and section 6 concludes the paper.

II. RELATED WORK

It is found that recommender system can be more effective by incorporating trust than traditional collaborative filtering. [41][46][32][9][60]. In [40] trust based recommender system is proposed using both trust metric and similarity metric. In [44] trust propagation model is proposed using number of hopes in trust propagation and the trust value is calculated between source to destination participant. In [36] a method is proposed for generating recommendations by trusted friends only. In [16] a novel trust model is developed based on recommendations in online service oriented environment. ACO is a nature in-spired metaheuristic for the solution of hard combinatorial op-timisation (CO) problems. A metaheuristic is a general-purpose algorithmic framework that defines the heuristic me-thods which can be applied to different optimization problems with relatively few modifications. [27][29][28][30] ACO has been used to solve many optimisation problems such as se-quential ordering [21], scheduling [6], assembly line balancing [7], probabilistic travelling salesman problem (TSP) [35] , DNA sequencing [8] , 2D-HP protein folding [3] and protein-ligand docking [33]. In [31] Ant Colony Optimization (ACO) is applied to build query association graphs from the query logs for the purpose of query recommendation. In [48] clustering based on ants is used to access to a variety of collaborative learning agent groups so as to fully mobilize the enthusiasm of colla-borative learning team members. In [62] the ant colony opti-mization is applied on the log data to build an adaptive domain model automatically in order to satisfy user‘s information re-quest effectively in more structured collections such as digital libraries, local Web sites, and intranets. In [39] combination of ant based clustering and fuzzy c-means is proposed. In [57] model is proposed which combines the ACO and Fuzzy logic to generate the list of recommendations to online users based on the comparison of the user‘s navigational behavior with other user‘s data. In [47] an ACO algorithm is developed called Ant-Recommender System which sense pheremones found on their clusters in order to determine the best cluster for re-commending the items with in clusters of user profiles. In [36] recommender system is proposed based on collaborative be-havior of ants by integrating trust between users. The hybrid of ACO and trust has been applied in various domains and shows promising results. It is found no work has been done which uses the hybrid of ACO and trust for effective web page optimization based on query log mining. The advantage of using hybrid of ACO and trust in query log mining for web page optimization is that it generates recommendations of relevant web pages using ACO based optimization on trusted colonies of web pages. Thus in this paper a novel approach is proposed using ACO and trust in query log mining for effective personalized web search. It is found in [53] that the perfor-mance of the Personalized Web Search was improved when converted into optimization problem and solved using Ant Co-lony optimization techniques by replacing the pheromone in ACO with Information Scent. In this paper work in [53] has been extended to apply the hybrid of trust and ACO in query log mining for identifying trusted colonies of web pages for recommendations in order to personalize the web search of the user more effectively.

III. BACKGROUND

3.1 Trust

The concept of Trust has been gaining increase amount of attention in research communities like online recommender system. A trust is defined as social phenomena and the model of trust for artificial world like web is based on how trust works between people in society.[1] Although vast literature on trust has grown in various areas of research with varying meaning of trust but a complete formal unambiguous definition of trust exists rarely in the literature.[11] In [61] the general properties of trust in e-services were surveyed and analyzed and the general properties of trust are listed as follows:

Water quality studies in hand-dug wells will help in assessing the chemical quality of water as compared to Ghana Standard Authority standards. In Begoro community, knowledge on the chemical quality of hand-dug wells will help in assessing the possible health effects of chemical contaminants in hand-dug wells so as to establish the chemical water quality differences between the hand-dug wells and pipe borne water. Such studies are useful in informing policy interventions on the intensification of education and implementation of regulations on safe drinking water by the Ghana Standards Board, the Ghana-Environmental Protection Agency (EPA), the District Environmental Health Units and Ghana Urban Water Company. This will go a long way to reduce incidences of water pollution and the associated water related diseases. This is because, chemical particles in hand-dug wells as a result of contamination and pollution from organic and inorganic ions underground, could cause heart infections, kidney problems, fluorosis, methaemoglobinaemia, and other water related diseases [9]. It is suspected that water from wells in unhygienic areas could be contaminated due to their proximity to sources of pollution. Contaminants such as bacteria, viruses, heavy metals, nitrates and salts have polluted water supplies as a result of inadequate treatment and disposal of waste from humans and livestock, industrial discharges, and overutilization of limited water resources [14]. Contaminants are regulated when they occur in drinking water

supplies and are expected to threaten public health [3], [15]. Authors explain that most levels of contamination that are established by the EPA allow sufficient margin of safety, but acceptable contaminant levels vary widely

among individuals and population groups. For example, high sodium levels, harmless for most people can be dangerous for the elderly, people with high blood pressure, pregnant women, and people having difficulty in excreting sodium. However, [15] do not consider the levels of chemical contaminants in drinking water high enough to cause acute or immediate health effects. Examples of acute health effects are nausea, lung irritation, skin rash, vomiting, dizziness, and even death. The authors expect contaminants to more likely cause chronic health effects - effects that occur long after repeated exposure to small amounts of a chemical. Examples of chronic health effects include cancer, liver and kidney damage, disorders of the nervous system, damage to the immune system, and birth defects. Fabrizi [5] found that in areas supplied with drinking water harder than 500 mg/l CaCO3, there were high incidence of gallbladder disease, urinary stones, arthritis and atrophies as compared with those supplied with soft water. Contamination can also take place in consumers‟ premises from materials used in plumbing, such as lead or copper, or from the back-flow of liquids into the distribution system as a consequence of improper connections. Such contaminants can be either chemical or microbiological. People who drink water containing radionuclide, such as alpha emitters, beta emitters, radon, and combined radium (226/228), in excess of EPA's standard over many years may have an increased risk of getting cancer [8]. It has been demonstrated that consuming water of low mineral content has negative effect on homeostasis mechanisms [16].

1.4 Concentrations of chlorides

Chlorides are widely distributed in nature as salts of sodium, calcium, and potassium. Chloride concentration in excess of

250mg/l or (250ppm) gives rise to taste in water [6]. According to the WHO, chloride in groundwater are from both natural and anthropogenic sources such as run-off containing road de- icing salts, the use of inorganic fertilizers, landfill leachates, septic tank effluents, animal feeds, industrial effluents, irrigation drainage, and seawater intrusion in coastal areas [7]. The US-EPA set an enforceable regulation for vinyl chloride called, maximum contaminant level (MCL) at 0.002mg/L or

2ppb. So, when contaminant level of vinyl chloride in water sample exceeds this amount, the water is said to be lethal to health. This is because people who drink water containing vinyl chloride in excess of the maximum contaminant level

(MCL) for many years have increased risk of cancer. Contamination of vinyl chloride occurs through leachates from polyvinyl chloride (PVC) pipes, discharged from plastic industries, sewage treatment plants, etc. US-EPA (2013) describes sodium and chloride in drinking water as „salt‟ since many people use the word „salt‟ for sodium or sodium chloride. When salt such as sodium chloride dissolves in water, it breaks into positively and negatively charged ions. Sodium chloride breaks up into sodium and chloride ions in water. The US-EPA [8] reissued a list known as the Drinking Water Contaminant Candidate List (DWCCL) in which sodium and chloride were included. The EPA identifies 250mg/L as a concentration at which chloride is expected to cause a salty taste in drinking water. Water users typically notice the presence of high chloride before an equal amount of sodium.

Chlorides are costly to remove from water. Effective treatments include, Reverse Osmosis (RO), Distillation, and De-ionization. Distillation is more costly to operate and is only feasible to a few gallons of water a day. It is not effective for organic contaminants. Whiles De-ionization is an effective method of water treatment, the chemicals are dangerous and inappropriate in a residence. This method has similarities to a water softener, but uses strong acids and bases rather than salt to regenerate the system. The US-EPA [9] view on chloride concentration in water is that, substantial levels of chloride imply contamination by human activities, including road salt storage, discharge from water softeners, human or animal waste, and leachates from landfills. It is known that, chloride concentration of well water exceeds that of sodium approximately 50% due to differences in atomic weights. Hence, judgments on concentrations of salts in should be made only after reviewing several samples that have been taken at difference times of the year. Effects of chlorides in water are explained by the presence of elevated chloride, and are initially considered as indication of increased risk of more serious chemical pollution. The elevated levels of chloride somewhat increase the ionic conductance of water, and thus increase the potential for corrosive damage to plumbing fixtures by water. International Organization for Standardization (IOS) [10] indicates that, sodium chloride (NaCl2) is widely used in the production of industrial chemicals, such as, caustic soda, chlorine, sodium chlorite, and sodium hypochlorite. Potassium chloride is used in the production of fertilizers. Hence, when a well is constructed near a farm it can be polluted by the farm through leachates. According to International Program on Chemical Safety [18] vinyl chloride is a narcotic agent that can cause loss of

consciousness at 25g/m3. The explanation is that, that concentration of vinyl chloride above 2g/m3, over periods ranging from one month to several years have been reported

to cause specific pathological syndrome found in people who get in contact with vinyl chloride. According to the [17], vinyl chloride has relatively low solubility in water and low capacity to be absorbed on particulate matter and sediment. When released to the ground, vinyl chloride is not absorbed on the soil but migrates readily to groundwater, where it may be degraded to carbon dioxide and chloride ion or remain unchanged for several months, or even years. Vinyl chloride has been reported in groundwater as a

degradation product of chlorinated solvents such as trichloroethene and

tetrachloroethene [17]. Clinical findings include scleroderma of connective tissues in fingers, with dermal thickening and subsequent bony changes in the tips of fingers called

acroosteolysis; peripheral circulatory changes with the classical picture of Reynaud disease; enlargement of the spleen and liver, with specific histological appearance and respiratory manifestation. Hence, the presence of chemical contaminants in water can lead to health issues, including gastrointestinal illness, reproductive problems, and neurological disorders. Infants, young children, pregnant women, the elderly, and people whose immune systems are compromised because of HIV/AIDS, chemotherapy, or transplant medications, may be especially susceptible to illness from some contaminants [4].

1.5 Concentration of fluorides

Fluoride is present in water and higher concentrations are usually associated with ground water. Skeletal fluorosis has been evidenced in persons when water contains more than 3.60 mg/l of fluoride [9]. Waterborne fluoride is a major cause of morbidity in parts of the world, including the Indian sub- continent, Africa and the Far East, where concentrations of fluoride can exceed 10 mg/l [1]. High intakes of fluoride can give rise to dental fluorosis, an unsightly brown mottling of teeth, but higher intakes result in skeletal fluorosis, a condition arising from increasing bone density and which can eventually lead to fractures and crippling skeletal deformity [1]. A WHO working group concluded that skeletal fluorosis and increased risk of bone fractures occur at a total intake of 14 mg fluoride per day, and there is evidence suggestive of an increased risk of bone effects at intakes above about 6 mg fluoride per day [1]. Public Health Engineering Department in West Bengal (2006) reports that, India is among 23 Nations where health problems occur due to consumption of fluoride contaminated water because, skeletal fluorosis has been evidenced in persons when water containing more than 3.60 mg/l of fluoride were consumed depending on intake from other sources.

1.6 Concentration of nitrates and nitrites

Contaminants such as heavy metals, nitrates and salt have the potential of polluting water supplies as a result of inadequate treatment and disposal of waste from humans and livestock, industrial discharges, and over-use of limited water resources [2]. The maximum contaminant level (MCL) for nitrate in drinking water is 10 milligrams per liter (mg/l), often expressed as 10 parts per million (ppm) - measured on the basis of the nitrogen content of nitrate [19]. According to [7], "high concentrations of nitrate and nitrite ions may give rise to potential health risks such as methmoglobinemia or „blue- baby-syndrome" particularly in pregnant women and bottle-fed infants respectively, nitrate at elevated concentrations is also known to result in cyanosis in infants". Infants have higher intake of water for weight than adults. Consequently, infants ingest relatively higher amounts of nitrate. WHO [19] reports that, high levels of nitrate from fertilizer or wastewater can present a serious health risk to infants, and poisons resulting from improper use or disposal of chemicals can cause long- term and chronic health problems for humans or animals. Some adults may be susceptible to the development of nitrite induced methmoglobinemia. These include pregnant women with a particular enzyme deficiency, adults with reduced stomach acidity, and those with a deficiency in the enzyme needed to change methemoglobin back to normal hemoglobin, a condition which can be hereditary [20]. Another concern about nitrate ingestion is the possibility that nitrites in the stomach and intestines may contribute to the development of some cancers. Nitrate in groundwater is of concern not only because of its toxic potential, but also because it may indicate contamination of the groundwater. For instance, a source of contamination due to animal waste or effluent from septic tanks, bacteria, viruses, and protozoa may be indicated by the presence of nitrates [21]. Contamination of groundwater by fertilizers may also indicate the presence of other agricultural chemicals such as pesticides. The source of nitrate may be a clue to other contaminants that may be present [1]. Studies indicate rapid and widespread distribution of vinyl chloride. Rapid metabolism and excretion limit the accumulation of vinyl chloride in the body. The highest concentrations of metabolites are found in the kidney, liver, spleen, etc., [18].

1.7 General quality requirement for drinking water

Color in water may be caused by the presence of minerals such as iron and manganese or by substances of vegetable origin such as algae and weeds [21]. Color tests can indicate the efficacy of the water treatment system [21]. Turbidity in water is caused by suspended solids and colloidal matter. This may be due to eroded soil caused by dredging or due to growth of micro-organisms. High turbidity makes filtration expensive. If sewage solids are present, pathogens may be encased in particles and may escape action of chlorine during disinfection [17]. In the case of drinking and other domestic usage of water, it should be potable and palatable. Potable in the sense that the water must be safe for human consumption without harmful organic or inorganic compounds, that could cause adverse physiological effects. For water to be palatable, that water must be free from turbidity, color, odor and objectionable taste [1]. However, the potable water supply appears inadequate and most of people depend on hand-dug wells, streams, and rainwater for water supply. For instance, only 30% of the people living in Begoro have access to infrequent supply of pipe borne water [21]. Begoro is one community in Fanteakwa District that lies in the middle of Eastern region as one of the oldest settlements with a population of about 23,569 [21]. Fanteakwa is one of

the Districts in Ghana that are well endowed with natural resources. The paper assesses the chemical water quality parameters in water from hand-dug wells and pipe-borne water and compares the levels with national and international standards.

IV. METHODOLOGY

Laboratory analysis was conducted to find the quality of water in hand-dug wells and pipe borne water in the Begoro community. Water samples were collected from five (5) hand- dug wells in the community and pipe borne at six sampling sites. The choice of hand-dug wells in the community was influenced by lateral distance from agricultural and sanitary sites, such as pit latrines, refuse dumps, farms, etc. that may predispose them to chemical contaminations from pesticide residues and other forms of organic wastes. Water samples were collected using sterilized sampler into thoroughly cleansed and well treated 1.5litres plastic bottles. At the site of sampling, the bottles were rinsed again with the samples water. Sampling was done by hand with the bottle held near the base with one hand, the cap removed and the bottle plunged downward into the water. The bottle was tilted slightly upward to displace the air and then pushed forward away from the hand to avoid contamination. Sample containers were sterilized and labeled as and when a sample is collected. To minimize bio-degradation between sampling and analysis, samples were immediately preserved in ice chest containing ice packs without freezing. This was done to minimize changes in content and maintain samples since travelling with the samples from study area to the laboratory was considered too long journey.

2.1 Equipment and Glassware

The following equipment and glassware were used: Hach DR/200 Spectrophotometer, analytical balance, incubator, autoclave, 250ml conical flask, beaker, burette, pipette, dropper, wash bottle, measuring cylinder, sterile sample bottles, culture tubes containing inverted Durham vials, paper, cello tape.

2.2 Procedure

Two sample cells were used for each analysis. One sample cell was filled with measured quantity of prepared sample and the other cell was filled with de-ionized water to serve as blank. The sample cell with its contents were placed in the Hach DR/200 Spectrophotometer and analyzed. The test was repeated for the samples depending on the quality parameter under investigation. In the argentometric titration, the water samples were filtered through a clean Whitman filter paper, and about 100ml discarded initially and the remaining kept in a beaker. 20ml of the filtered water samples was pipette into a conical flask and acidified with 5ml 6MHNO3. 0.01M AgNO3 was added to the water sample from the burette to give 5mL excess. This was done by adding 5mL of AgNO3 when turbidity of the mixture persists. 2ml of pure nitrobenzene was added followed by 1ml ferric alum indicator. The solution was gently swirled till the chlorides precipitated. The excess AgNO3 was titrated with 0.1M NH4SCN till a permanent faint brown coloration appeared. The titration was repeated three (3) times to obtain average values. Spectrometric, colorimetric, and titration with EDTA methods were used for fluoride, nitrate, and hardness, respectively.

Offline Preprocessing

1. Data Set Collected on the Web is preprocessed to get the Query Sessions.

2. For each clicked URLs in the query session, the Information Scent Metric is calculated using Eq. (1)

3. Query sessions keyword vector is generated from query sessions using Information Scent and content of Clicked URLs using Eq. (3).

4. k-means algorithm is used for clustering query sessions keyword vector.

5. Each cluster i is associated with the mean keyword vector clusteri_mean.

6. For each cluster i the initial value of pheromone is calculated as follows

a. Each clicked URLs of the user query session is associated with the initial pheromone value τpheremoneclickedURLs 0 = Information Scent of the Clicked URLs. ΔτURLs =0. where ΔτURLs is the quantity trail sub-stance (pheromone in real ants) laid on Clicked URLs by the kth user/ant between time t and t+n;

b. For each distinct clicked URL in the given clus-ter identify $\tau avgpheremoneURLs$ 0 which is calculated over all the query sessions present in the given cluster.

7. Clicked count and recommended count are defined for each distinct clicked URLs and are initialized to zero in the list L associated with each cluster

8. Initialize Trust(ClickedURLi)=0 for each distinct clicked URL in the List L associated to each cluster i.

9. For each cluster i the initial

V. RESULTS AND DISCUSSIONS

Chemical parameters are very important in water quality analysis for hand dug wells used for drinking and other purposes. Most of the chemical parameters are known to have health effects on users whiles others are not. Due to this, the Guidelines for Drinking Water [22] and Ghana Standard Authority guidelines were used in discussing and comparing the results obtained. The overall suitability of water from hand dug wells for drinking purpose were compared to the pipe borne water quality based on the

similar tests. The results are discussed under; (a) the chemical quality of water in hand-dug wells compared to Ghana Standard Authority standards in Begoro, (b) possible health effects of chemical contaminants in hand-dug wells, (c) chemical quality of hand-dug wells whether it meets the Ghana Standard Authority standards, and (d) chemical water quality differences between the hand-dug wells and pipe borne water in Begoro community.

3.1 Comparing chemical quality of water in hand-dug wells in Begoro with Ghana Standards Authority guidelines

From table 1, the chemical quality of hand-dug wells were within the guideline limits of Ghana Standards Authority, comparatively. The values were below the guideline values. Whiles chloride values in the hand-dug wells ranged between, 200.6 mg/l to 210.5 mg/l, the Ghana standard Authority maximum value for chloride was 250.0 mg/l. Fluoride concentration in hand-dug wells ranged from 0.50mg/l to 0.90mg/l, compared to GSA‟s standard of 1.50mg/l. This means that when we compare the values in the hand dug wells to the national guidelines, the one from the hand-dug wells were lesser than the maximum considered value. Nitrate concentration in the hand-dug wells was within the guideline values of GSA. The result ranges from 10.5mg/l to 16.0mg/l; whiles the GSA value is 50mg/l. The same observation or conclusion can be made for total hardness which value was between 51.0 and 89.5mg/l and Ghana Standard Authority guideline value was 350.0mg/l. The Ghana Standards Authority (GSA) standard for chloride is 250mg/l, whiles chloride in hand-dug wells in Begoro is lower than the

3.2 Possible health effects of the chemical contaminants in hand-dug wells.

Chloride ions are non-cumulative toxins, an excessive amount of which, if taken over a period of time, can constitute a health hazard indicated by [23]. As observed in the Table 1, chloride

Pipe Borne

GSA Standards

200.6	0.50	7.3	50.0
250	1.5	50.0	350.0

level in hand-dug wells and pipe borne water were generally low, implying that there may not be any health effects by drinking water from both the hand-dug wells and the pipe borne water. Chloride concentration in excess of 250mg/l or (250ppm) gives rise to taste in water as indicated by [6]. Hand dug wells were characterized by low fluoride ion concentrations (0.50 to 0.95), and fell within WHO and Ghana Urban Water Company (GUWC) acceptable limits of drinking and potable water (1.5 mg/l). The fluoride level in the hand dug wells were also low (0.50 to 0.90mg/l), indicating that there will not be any health hazards associated with consuming of water containing fluoride. Fluoride in pipe borne water (0.50mg/l) was below the GSA guideline levels. Fluoride is expected to be present in water and higher concentrations are usually associated with ground water. Skeletal fluorosis has been evidenced in persons when water contains more than 3.60 mg/l of fluoride as observed by [9] report. Hardness is a natural characteristic of water which can enhance its palatability and consumer acceptability for drinking purposes. Health studies in several countries in recent years indicate that mortality rates from heart diseases are lower in areas with hard water indicated by [8]. Undesirable effects due to the presence of calcium and magnesium in drinking water may result in rendering water hard. Hand dug wells and pipe borne water in Begoro are characterized by moderately low (51.0-

89.0mg/l; 50.0mg/l) calcium carbonate (CaCO3) ion concentrations and are within WHO/GSA maximum acceptable limits for drinking and potable water (350 mg/l). Hence, the water is soft. In areas supplied with drinking water harder than

500 mg/l CaCO3, higher incidence of gallbladder disease, urinary stones, arthritis and atrophies as compared with those supplied with soft water are reported by [5]. Low total hardness of water indicates that health problems may not be associated with the drinking water.

WHO standards	250	1.5	50.0	350.0

Source: Laboratory Tests, 2015

3.3 Comparing chemical quality of hand-dug wells with

(GSA) standards

In Figure 1, hand-dug wells with an average value of 13.1mg/l nitrate ion concentration are shown. This means that nitrate concentration in the hand dug wells is lower than [22] edition of water quality standards, whose recommended value is 50mg/l nitrite for drinking water. This shows that, water in hand-dug wells in Begoro is safe for drinking. High values of nitrate in Figure 1, can result in algal growth and phytoplankton causing eutrophication which may adversely affect the quality of the water [22]. High nitrate levels in water for drinking are hazardous to infants since this can induce the "blue baby" syndrome or methaemoglobinaemia [22]. The syndrome also affects pregnant women with particular enzyme deficiency, adults with reduced stomach acidity, and those with deficiency in the enzyme needed to change methemoglobin back to normal hemoglobin, a condition which can be hereditary. The nitrate itself is not a direct toxicant but a health hazard if it is converted to nitrite which reacts with blood haemoglobin to cause methaemoglobinaemia [8]. Hence, comparatively, water quality values obtained in Begoro indicate that health hazards may not be associated with drinking water from

hand-dug wells and pipe borne water sources in relation to nitrate concentration.

VI. CONCLUSION

In this research an approach is proposed for personalized web search using Trust and ACO. The use of trusted web pages for optimization identifies identifies the colony of web pages fre-quently accessed by the users with similar information need. Thus the optimization of trusted clicked urls will retrieve more and more relevant documents and improves the precision of search results. Experiment was conducted on the data set of web query sessions collected in the three domains entertain-ment, academics and sports. The results show the significant improvement in the precision of search results and personalize the web search effectively by catering to the information need of the user. In future this work can be extended to reduce the dimensionality of clustered query sessions in order to reduce the computational complexity and further improve the perfor-mance of the proposed system.

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