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FindX: A comprehensive approach for Lost and Find Application using Image Matching Algorithm

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Abstract— **On living in the current scenario, missing some valuable items is common. It may result in a large problem like losing identity, chances for missing achievements etc. Excluding manual methods there is no sufficient mechanism for finding lost items. A common application which will assist user who found some missed item and user who lost item, to communicate each other with proper authentication mechanisms will be a perfect solution for this problem.**

"FindX", is a web application implemented on java platform for the purpose of Lost and Found process. The problem of slow and ineffective in searching the lost personals which caused people to waste their time with few chances of success and may affect them badly so, it turn out to be our inspiration to develop the FindX application on mobile as well as on web to provide a faster, effective and user-friendly searching tool which people mainly used to search for the lost personals. Here we are providing authentication, using a three way security mechanism with the help of an image matching algorithm.

Keywords—FindX, Lost and Found application, Image matching algorithm, 3 way security mechanism.

I. INTRODUCTION

Creating a ubiquitous system that would help decrease the work load of a human being is the main aspect of any new invention. After all the inventions and discoveries, one thing that has been troubling man despite of the luxury is, locating lost objects. On a daily basis, people face the problem of misplacing their stuff which might be valuable or have a special meaning to them. Another case is when a person loses an item that has very sensitive information and this loss might cause a considerable impact such as misplacing mobile device, identity cards, and passports. One more case to be considered is child missing due to kidnapping, child labor etc. Technology has the opportunity to assist people in this problem. In recent years, several systems have been introduced to keep track of lost items and help people in finding them. Most of them are of lack of authentication. We also have noticed the high level of participation and interactivity between the members of our society in social networks like Twitter, Facebook, Instagram and how the people are willing to help each other through these networks. The concept simply aims to automate the process of connecting the person who has lost something with the person who has found something with clear way of 3-way authentication.

This paper is structured as follows: Section II describes the work related to locating the missing items. Section III illustrates the existing system. Section IV provides mechanisms for connecting the owners of lost items with individuals who have found these items and the authentication process. We conclude in section V with a summary of what has been introduces in this research study along with the future work of the system.

II. RELATED WORK

In recent years, advances in technology in general, and social computing in particular, have led to proliferation in research examining how these networks can facilitate better communication amongst individuals . Most of them where like Radio Frequency Identification (RFID) readers, ultrasonic position detection systems and sensors [6,9, and 11]. There are three more examples of such research studies, first one is a support system for finding lost objects using spotlight [6] which were developed to locate the objects indoors using light notification technique. Another example was the system named: Where's My Stuff? [9] and was designed for helping visually impaired individuals to find their missing objects

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within a range of 30 meters through using Bluetooth-enabled tags which can be activated via an application installed on devices that have Bluetooth technology. The third one was mainly relying on a concept common to our proposed idea in that it adopts a community-based reporting system to trace the lost/found items. On the other hand, it relies on using RFID readers which are embedded in mobile phones to scan objects' RFID tags and send the gathered data to the server-side software to find the objects' owners [4]. Furthermore,[11] provides a full analysis of the type of lost objects, places where they have found, persons who have lost them and the search strategies which were used based on distributed surveys. In addition, through our search for similar systems, three websites have been found which are developed to provide services similar to our proposed idea. These websites are: Lost my stuff [6], The Internet Lost and Found and Mafgod [10]. As for the language of those websites, the first two websites are using the English language. However, the third one is an Arabic website and by comparing them to our system, we are planning to use the Arabic language as the main language and we are going to provide the option to use the English language if necessary. Moreover, Mafgod is dedicated to serve people who have lost or have found mobile phones only. In contrast, the Locate it! System is not limited in serving a small segment of the society; almost all kinds of items can be reported as lost or found without any limitations. Furthermore, Lost my stuff [6] website is designed to rely on volunteers who are registered on the website and have specified their locations. Thus, whenever an item is reported as lost, the system forwards the request to a volunteer who exists in a location near from where the item was lost to provide help in finding it. As a result, it doesn't use an algorithm to match items with each other and generate recommendations. Also, it doesn't have the functionality where anyone can report a found item. On the other hand, we are planning to implement a recommender system which is based on the comparison of the lost items versus the found items which are stored in the database and generate recommendations to assist the user in locating his/her items in a short time. [7] proposed a system in which OWT extracts wavelet features which give a good separation of different patterns. Moreover the proposed algorithm uses morphological operators for effective segmentation. From the qualitative and quantitative results, it is concluded that our proposed method has improved segmentation quality and it is reliable, fast and can be used with reduced computational complexity than direct applications of Histogram Clustering. The main advantage of this method is the use of single parameter and also very faster. While comparing with five color spaces, segmentation scheme produces results noticeably better in RGB color space compared to all other color spaces.

III. EXISTING SYSTEM

In the context of the lost and found for personal possessions, there are few research studies which have been made for the purpose of locating missing objects, however; most of them were concerned with detecting the exact location of the missing object through using technologies such as Locate it![1]. Locate it! Is an online social community for connecting individuals with lost items with people who found these items. The communication in this Arabic social network is based on the contribution of individuals in the Kingdom of Saudi Arabia. This is a pure Arabic application and was of negligible mechanisms of authenticity.

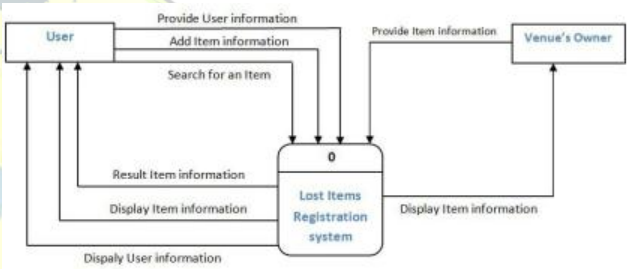

Fig. 1 Architecture of Locate it!

IV. PROPOSED SYSTEM

The system is comprised of two mechanisms, one is the Communication mechanism and the other one is three way Authentication mechanisms.

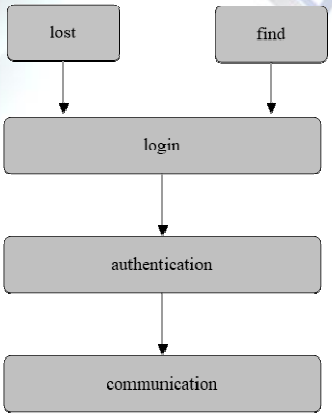

Fig 2: System Architecture

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A. *Communication Mechanism*

As mentioned above here a casual user can be a founder or loser. Initially the two users will post their advertisements on application.

The person who lost can search the entire found list according to the category given. Each entry of the find user list will only contains basic informations like item name, color etc. Now the user have to communicate with the person who posted found add according to the filtering done. Now the person who lost item should passed through 3 way authentication mechanism. At the end of 3 way authentication it will be clear whether the user is valid or not. If the user is valid he can collect the contact information of the founder and he can use the live chat for communication.

Fig 3: Communication process

The person who found item will post the found add along with required information for 3 way authentication mechanism. Here the user has two options for communicating to the valid owner of the item. He can request 3 way authentication or direct police assistance via the application itself. The valid owner will communicate to the user via the contact information given by the user. When the user requesting police assistance he is directly requesting police assistance to find the valid owner. Here an e-request will be send to nearby police station along with the user contact information. Now the police can contact the user.

B. *3-Way authentication mechanism*

The communication will be possible only if the lost user successfully completes 3-way authentication process. If the authentication is failure then the user can request police assistance. The authentication mechanism is comprised of following three steps.

- Image matching algorithm
- Matching algorithm
- Security question

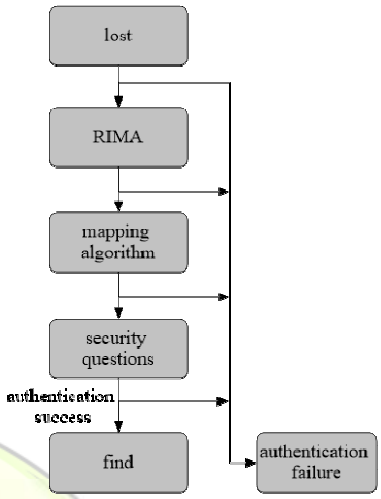

Fig 4: 3- way authentication

- Image Matching Algorithm

Here the image uploaded by the find user will be compared with the image uploaded by the lost user. The matching algorithm will analyze whether these two images are of similar item. Algorithm used here is Robust Image Matching Algorithm. Basic concepts of RIMA are following.

- Distance Transform:

The true Euclidian distance [15] is resource demanding (time, memory) to compute, therefore an approximation is used. Good integer approximations of Euclidean distance can be computed by a process known as chamfer 3-4 distance [14], and [4]. The process of converting a binary image to an approximate distance image is called distance transformation (DT). Chamfer distances are the distances between horizontal /vertical neighbours and two local distances in a 3x3 neighbourhood.

In the binary edge image each edge pixel is first set to zero and each non edge pixel is set to infinity. If the DT is computed by parallel propagation of local distances then at each iteration each pixel obtains a new value using the expression [8]:

$$v^{k}_{i,j} = \text{minimum}(v^{k-1}_{i-1,j-1} + 4,\ v^{k-1}_{i-1,j} + 3,\ v^{k-1}_{i-1,j+1} + 4,\ v^{k-1}_{i,j-1} + 3,\ v^{k-1}_{i,j},\ v^{k-1}_{i,j-1} + 3,\ v^{k-1}_{i+1,j-1} + 4,\ v^{k-1}_{i+1,j-1} + 3,\ v^{k-1}_{i+1,j+1} + 4) \quad (1)$$

Where v^{k}_{ij} is the value of the pixel in position (ij) at iteration k. The iteration continues until no value changes. The number

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of iterations is proportional to the longest distance occurring in the image.

To speed up the distance computation process, sequential DT algorithm [8] is used where two passes are made over the image: "forward" left to right; "backward" right to left.

- Prepolygon

In the prepolygon image, the edge pixels are extracted and converted to a list of coordinate pairs, each pair being the row and column numbers of an edge pixel. From this list the edge points that are actually used are later chosen according to some criterion, which is application dependent. These chosen points are called the polygon, even though the points may be scattered or representing several polygon segments.

- Matching Measure:

A perfect fit between the two edges will result in edge distance zero, as each polygon point will then hit an edge pixel. The actual matching consists of minimizing the edge distance. To make this minimization as simple as possible, the edge distance function should be as smooth and convex as possible. There are many variants of matching measure averages, e.g. arithmetic, root mean square and median.

$$\text{Arithmetic average distance} = (V_1 + V_2 + \ldots + V_N)/N \quad (2)$$

$$\text{Root mean square average distance} = \{(V_1^2 + V_2^2 + \ldots + V_N^2)/N\}^{1/2} / 3 \quad (3)$$

Where N is total number of points in polygon and v_1, v_2, . . .,v_N are pixel values of corresponding coordinate pairs.

$$a_{rithmetic} = (3+3+3+3+0+3+3+3+3)/9 = .8889$$

$$d_{rms} = \{(3^2+3^2+3^2+3^2+0+3^2+3^2+3^2+3^2+3^2)/9\}^{1/2}/3 = .9428$$

Each position of the polygon corresponds to an edge distance. The position with minimum edge distance is matching position. The translation and rotational parameters defines the polygon matching position.

- Robust Image Matching Algorithm(RIMA)

RIMA[2] is low level feature based method using DT. Here model image is translated to distance transform, and template image which is polygon is superimposed onto the model and matching is found as per matching measure. In RIMA, edge points or low level feature points are extracted from digital images (using any suitable edge extraction scheme), converted to binary images, which are distance transformed, and then distance transform is used for matching. The distance transform of template is superimposed on the distance transform of the model and values are subtracted pixel wise and matching is found as per the metric. We propose few matching measures: ranked highest numbers of zeros, range, minimum average and RMS value.

- **Algorithm and Matching Measure**

Consider a reference image A(upload by lost) of size MXN and a template image B of size OXP with elements $a_{m,n}$ and $b_{o,p}$ respectively. Assume A≥B; m=1,2,….,M; n=1,2,….,N; o=1,2,….,O;
P=1,2,….,P; range1> range2. We can define C, such that c=oϵO,pϵP[c_0,p]for all o and p.

```
for q=O: m-o
   for 1-0: n-p
   C= oϵ O, pϵP[ [a0+q,p+r]-B]
   Measure l=find[oϵO,pϵP[co,p=0]]
      Measure2=find[oϵO,pϵP [rangel<co,p<range2]]
OR
      Measure2=find[|c0,p|<range]
      Measure3= arithmetic average[oϵO,pϵP[co,p]]
      Measure4=rms average [oϵ 0, pϵp [Co,p]
  end
end
```

Here define four different measures in algorithm for matching. In first, the maximum number of zeros elements are searched after subtracting the template DT from reference DT. If the number of zeros elements ar**e** equal to the maximum size of the template, then there is a perfect match. However if the number of zero elements after subtraction is not equal to the maximum array size, the match is not the perfect and that will happen in case of occluded, rotated, scaled and perturbed images.

In second, after subtraction of template from reference, the resultant image points are checked for the predefined range and we maximize the difference in that range. To avoid false matching, range is reduced. Goal is to find a translation at which the numbers in the range maximizes, which will be a match and we can also give the confidence level of matching.

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In third, we propose taking the arithmetic average (2) of all the numbers and find the absolute minimum value. The minimum value is the match, and we can have a confidence matching level. If absolute minimum value is zero at a specific translation we have perfect match.

And in fourth, propose taking the RMS average (3) of all the numbers and find the minimum value. The minimum value is the match, and here too we have a confidence level. If minimum RMS value is zero at a specific translation we have perfect match.

- Matching Algorithm

The found user should enter 4 key informations which together act as a primary key of the particular item which have been found. The matching algorithm will validate whether the information entered by the lost user matches to the information enter by the find user. Any conventional matching algorithms[12,13] can be used for this purpose. For example consider case of someone lost a voter's identity card and someone found it. Here the find user could enter following fields.

1. Name of the owner.
2. ID card no.
3. Date of issue of ID card.
4. Date of birth of the owner.

The algorithm will validate, whether the given key informations matches to the input given by the lost user. If it is not then the owner authentication will be a failure.

- Security Question

Here the find user can ask a random security question which will uniquely identifies the item. The found user should answer the question correctly. For example found user can ask for an unusual remark on the particular item like scratch, markings etc. If the user couldn't answer the question then it will be an authentication failure.

V. CONCLUSION

In this busy world people are facing a common problem of missing personals. It may affect badly in their day to day life. Existing systems are not in a proper way of authenticity. People, who find items, are ready to return it back. But they are not confirmed whether the requester is genuine owner or not.

This paper introduces a 3-way authentication mechanism for identifying whether the requester is genuine or not. Through the 3 way authentication mechanism the find user can ensure the requester is genuine or not. The proposing system also provides a direct police assistance facility. The user can request police assistance at instance of the process. The main purpose of this project is to take the advantage from the dynamic data in social networking to create a community of people helping each other and collaborating for locating the objects in a secure and reliable way.

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