B.Sc. in Computer Science and Engineering Thesis

Automatic Bangla License Plate Recognition

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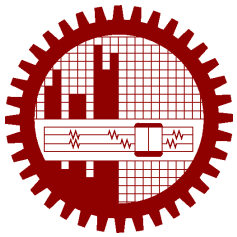

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Dhaka, Bangladesh

February 2017

CANDIDATES' DECLARATION

This is to certify that the work presented in this thesis, titled, "Automatic Bangla License Plate Recognition", is the outcome of the investigation and research carried out by us under the supervision of Supervisor Name.

It is also declared that neither this thesis nor any part thereof has been submitted anywhere else for the award of any degree, diploma or other qualifications.

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CERTIFICATION

This thesis titled, **"Automatic Bangla License Plate Recognition"**, submitted by the group as mentioned below has been accepted as satisfactory in partial fulfillment of the requirements for the degree B.Sc. in Computer Science and Engineering in February 2017.

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ABSTRACT

Write your thesis abstract here.

Chapter 1

Introduction

1.1 Automatic Bangla License Plate Recognition

Automatic Bangla License Plate Recognition(ALPR) means detecting bangla languager characters from a license plate of any vehicle without human intervention. In this character recognition process we have follow the procedures given below.

- Reduction of noise from already captured car images.
- Feature extraction.
- Creation of data set from the features.
- Recognition of characters.

Distorted detection of License Plate(LP) makes this procedure difficult. To extract the correct feature value from the image, some preprocesses need to be handled. Some significant issues such as,

- Straighten the image
- Smoothing the image
- Reduction of noise

1.2 Applications of ALPR

In an ALPR system, stationary cameras are mounted on road signs, street lights, buildings or highway overpass for capturing images of moving or parked vehicles. Then the captured images

will go through a software system that will first detect the LP location in the image and then using the image, will extract some features values, and then using the features values in some machine learning algorithms finally get the final readings of that vehicle license plate. The recovered identity of the vehicle can be used in real time or stored in the database for future use.

One of the most important applications of ALPR system is traffic law enforcement. ALPR system can be used for automatic and faster identification of stolen vehicles, criminal cars, speeder and traffic law breakers. Another great approach is automatic toll collection for highways, flyovers and bridges. This automatic approach saves time and reduce traffic congestion during toll collection. Even is gas station, shopping mall parking ALPR can be very handy to managing car access. Many developed countries are using ALPR for this kind of purposes to make their system more automated and make day to day life of people more easier.

1.3 Background and Motivation

ALPR is becoming popular from the past decades because of it's various real-life applications. Mainly a ALPR system consists of three important steps. Image acquisition, LP detection, feature extraction and character recognition. Among this three steps feature extraction and character recognition is totally software dependent and have to face many technical issues. The image acquired from the previous is not always suitable for feature extraction and character recognition. So, some preprocessing has to be done. Otherwise accuracy of character recognition will not be that satisfactory. So, far many algorithm and features has been implemented for optical character recognition. But all the algorithm and features have some flaws and weakness. Most of the algorithms have not considered the distorted, noisy ,titled, low contrasted images that much. That's why particular afford is needed to consider those problems and hence make such feature to make the most accuracy of character recognition.

1.4 Objective

In this thesis our objective was to extract feature values from already detected LP and then using machine language algorithm to detect the characters. To develop an effective ALPR, we considered the issue of hazardous image background, low contrast image and horizontal tilt problem. Specific objective if this thesis is stated below.

- Automatic feature extraction and recognition of Bangla characters from noiseless clean printed LP images.
- Automatic feature extraction and recognition of Bangla character from distorted, low

contrast images.

- Automated character recognition from Bangla handwritten dataset.

1.5 Scope of the Thesis

- In this thesis we focus only on feature extraction and character recognition. We are not concern about detecting license plate from the vehicle image.
- In case of noisy image we try to remove noise as far as possible as the detection if image was not in our concern. Too much noisy and distorted images are not considered.
- We try to implement those features only which we think suitable for our images of vehicles.
- For image segmentation we initially segmented the character portion and the digits portion.
- Images where character portion and digit portion got overlapped wasn't considered.

1.6 Outline of Thesis

The rest of the thesis is organized as follows: In the Chapter 2, we briefly describe several feature extraction techniques and algorithms that we used for our ALPR system. Also the literature review of several existing ALPR techniques are given in this chapter.

Chapter 2

Citation Examples

In this chapter we show how we can cite the references.

2.1 See the Citations

As discussed by authors in [1–3] we can further show how this affects us. Moreover [4–11] can be examples for the previous works. Among these [10, 12–17] are the prominent ones. Also you can take a look at [18–25].

Chapter 3

Another Chapter

3.1 A Section

Some text.

3.1.1 This is a Subsection

And some more.

This is a Subsubsection

Yet some more.

3.2 And Another Section

Here are some dummy texts.

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Chapter 4

Index Creation

4.1 BUET

Bangladesh University of Engineering and Technology, abbreviated as BUET, is one of the most prestigious institutions for higher studies in the country. About 5500 students are pursuing undergraduate and postgraduate studies in engineering, architecture, planning and science in this institution. At present, BUET has sixteen teaching departments under five faculties and it has three institutes. Every year the intake of undergraduate students is around 900, while the intake of graduate students in Master's and PhD programs is around 1000. A total of about five hundred teachers are teaching in these departments and institutes. There are additional teaching posts like Dr. Rashid Professor, Professor Emeritus and Supernumerary Professors.

4.2 Campus

The BUET campus is in the heart of Dhaka — the capital city of Bangladesh. It has a compact campus with halls of residence within walking distances of the academic buildings. The physical expansion of the University over the last three decades has been impressive with construction of new academic buildings, auditorium complex, halls of residence, etc.

4.3 History

BUET is the oldest institution for the study of Engineering and Architecture in Bangladesh. The history of this institution dates back to the days of Dhaka Survey School which was established at Nalgola, in Old Dhaka in 1876 to train Surveyors for the then Government of Bengal of British India. As the years passed, the Survey School became the Ahsanullah School of En-

gineering offering three-year diploma courses in Civil, Electrical and Mechanical Engineering. In recognition of the generous financial contribution from the then Nawab of Dhaka, it was named after his father Khawja Ahsanullah. It moved to its present premises in 1912. In 1947, the School was upgraded to Ahsanullah Engineering College as a Faculty of Engineering under the University of Dhaka, offering four-year bachelors courses in Civil, Electrical, Mechanical, Chemical and Metallurgical Engineering. In order to create facilities for postgraduate studies and research, Ahsanullah Engineering College was upgraded to the status of a University in 1962 and was named East Pakistan University of Engineering and Technology. After the War of Liberation in 1971, Bangladesh became an independent state and the university was renamed as the Bangladesh University of Engineering and Technology.

4.4 Students

Till today, it has produced around 25,000 graduates in different branches of engineering and architecture, and has established a good reputation all over the world for the quality of its graduates, many of whom have excelled in their profession in different parts of the globe. It was able to attract students from countries like India, Nepal, Iran, Jordan, Malaysia, Sri Lanka, Pakistan and Palestine.

4.5 Departments

Both Undergraduate and Postgraduate studies and research are now among the primary functions of the University. Eleven departments under five faculties offer Bachelor Degrees, while most of the departments and institutes offer Master's Degrees and some of the departments have Ph.D. programs. In addition to its own research programs, the university undertakes research programs sponsored by outside organizations like European Union, UNO, Commonwealth, UGC, etc. The expertise of the University teachers and the laboratory facilities of the University are also utilized to solve problems and to provide up-to-date engineering and technological knowledge to the various organizations of the country.

Chapter 5

k-safe Labeling of Petersen Graph

In 1898, Petersen produced a trivalent graph with no leaves, now called the Petersen graph [26]. In this chapter we study k-safe labeling for the Petersen graph. We also give upper bound for the span of the Petersen graph. We provide necessary proof for the upper bound.

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Index

Appendix A

Algorithms

A.1 Sample Algorithm

In Algorithm 1 we show how to calcute $y = x^n$.

Algorithm 1 Calculate $y = x^n$

Require: $n \geq 0 \vee x \neq 0$
Ensure: $y = x^n$
  $y \leftarrow 1$
  if $n < 0$ **then**
    $X \leftarrow 1/x$
    $N \leftarrow -n$
  else
    $X \leftarrow x$
    $N \leftarrow n$
  end if
  while $N \neq 0$ **do**
    if N is even **then**
      $X \leftarrow X \times X$
      $N \leftarrow N/2$
    else $\{N$ is odd$\}$
      $y \leftarrow y \times X$
      $N \leftarrow N - 1$
    end if
  end while

Appendix B

Codes

B.1 Sample Code

We use this code to find out...

```
#include <stdio.h>
int Fibonacci(int);

main()
{
  int n, i = 0, c;

  printf("Enter the value of n: ");
  scanf("%d",&n);

  printf("\nFibonacci series\n");

  for (c = 1 ; c <= n ; c++)
    {
      printf("%d\n", Fibonacci(i));
      i++;
    }

  return 0;
}

int Fibonacci(int n)
{
```

```
24   if (n == 0)
25     return 0;
26   else if (n == 1)
27     return 1;
28   else
29     return (Fibonacci(n-1) + Fibonacci(n-2));
30 }
```

B.2 Another Sample Code

```
1  SELECT associations2.object_id, associations2.term_id,
2         associations2.cat_ID, associations2.term_taxonomy_id
3  FROM (SELECT objects_tags.object_id, objects_tags.term_id,
4       wp_cb_tags2cats.cat_ID, categories.term_taxonomy_id
5  FROM (SELECT wp_term_relationships.object_id,
6       wp_term_taxonomy.term_id, wp_term_taxonomy.term_taxonomy_id
7  FROM wp_term_relationships
8  LEFT JOIN wp_term_taxonomy ON
9       wp_term_relationships.term_taxonomy_id =
10      wp_term_taxonomy.term_taxonomy_id
11 ORDER BY object_id ASC, term_id ASC)
12 AS objects_tags
13 LEFT JOIN wp_cb_tags2cats ON objects_tags.term_id =
14      wp_cb_tags2cats.tag_ID
15 LEFT JOIN (SELECT wp_term_relationships.object_id,
16      wp_term_taxonomy.term_id as cat_ID,
17      wp_term_taxonomy.term_taxonomy_id
18 FROM wp_term_relationships
19 LEFT JOIN wp_term_taxonomy ON
20      wp_term_relationships.term_taxonomy_id =
21      wp_term_taxonomy.term_taxonomy_id
22 WHERE wp_term_taxonomy.taxonomy = 'category'
23 GROUP BY object_id, cat_ID, term_taxonomy_id
24 ORDER BY object_id, cat_ID, term_taxonomy_id)
25 AS categories on wp_cb_tags2cats.cat_ID = categories.term_id
26 WHERE objects_tags.term_id = wp_cb_tags2cats.tag_ID
27 GROUP BY object_id, term_id, cat_ID, term_taxonomy_id
28 ORDER BY object_id ASC, term_id ASC, cat_ID ASC)
29 AS associations2
30 LEFT JOIN categories ON associations2.object_id =
```

```
31      categories.object_id
32 WHERE associations2.cat_ID <> categories.cat_ID
33 GROUP BY object_id, term_id, cat_ID, term_taxonomy_id
34 ORDER BY object_id, term_id, cat_ID, term_taxonomy_id
```

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