Maltese Braille Translator

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***Abstract*—This research concerns the feasibility of creating tools that can translate Maltese text to Maltese Braille and vice versa, then measuring their accuracy. Such a tool would help educators provide better aid to visually impaired students within the Maltese educational system. In this research, a translation method is proposed wherein any text that is typed into the translator will be translated from either Maltese to Maltese Braille or Maltese Braille to Maltese. This is done through a series of conditional expressions as well as through using a data set containing attribute-value pairs representing the Maltese alphabet in both Braille and Latin script. The proposed solution manages to produce accurate translations in most of the cases presented. Further improvements for future research and challenging situations are also included.**

***Index Terms*—Maltese, Braille, Translation, Assistive Technology**

I. Introduction

The overall theme of this paper is Maltese braille translation. The aim is to create Maltese Braille translation tools that can help people who are assisting visually impaired students. The tools will also be tested for their effectiveness in translation and the results of this testing can be found in Section IV. If this translation can be done through tools such as a software translator, the time taken for an educator to translate certain educational material can be cut drastically. Section II will discuss any current methodologies for Braille translation and the data sets used. Section III will go over the methods used in this paper for braille translation. Finally Section V will answer the following research questions:

1) Does a data set need to be created for Maltese Braille?
2) Can a translator that translates Maltese text to Maltese Braille and vice versa be created?
3) Can this translator be offered as a service so that people can use it in other projects?

II. Literature Review

The braille method for communication was invented by Louis Braille at around 1834 [1]. The Maltese system for braille follows the international code. The difference between Maltese braille and the standard braille code is that Maltese braille uses the international code for "C c" to show the letter "Ċ ċ" as well as the code for "Y y" to show the letter "Ż ż". Other Maltese characters have unique braille codes.

Braille translation happens in grades. A grade 1 translation is the simplest form where translation occurs letter-by-letter. Grade 2 translation includes an addition of abbreviations and contractions and grade 3 translation includes various non-standardized personal braille codes. [2] For the sake of this paper, we will be considering grade 1 translation since it is the most widely used for the Maltese language.

A very popular software braille translator that is currently used by the Foundation for Information Technology Accessibility (FITA) is the Duxbury Braille Translator. This software has support for Maltese braille translation, but is quite expensive. The base application for the Duxbury system is also quite old since it was released in 1995. [3] The translator is also quite limited in its support for other applications since it can only be used with bespoke Duxbury software. These factors make it so that this translation technology is almost never used in a Maltese classroom.

During an interview with a Maltese teacher for the visually impaired it was made clear that pre-existing systems are not readily accessible to the general Maltese learning support assistant that is assigned to a visually impaired student. Software like the Duxbury software is simply not feasible in a Maltese classroom since it is too expensive. Visually impaired students are already faced with a lot of challenges [4] and a lack of appropriate tools given to their educators certainly hurts their education further. In order to create a translator that is accessible to all, it was imperative that the translator was built from scratch using a custom data set that contained all the Maltese braille characters.

The ASCII character set contains special characters specifically made to represent braille code. While a data set that contains these ASCII characters and their correlation to the internationally standard code was found, no data set was found that was specifically created to represent the Maltese braille code. A commercial site with reference to Maltese braille has incorrect data since it does not contain Maltese letters at all.[1]. Therefore a data set for the Maltese braille code was created from scratch. Later in the development a more robust data set was created so that translations can occur both ways. (I.E. From braille to Maltese and from Maltese to braille) These custom data sets were labeled v1 and v2 respectively.

1) PharmaBraille Malta Braille Code,
2) Custom Maltese Braille Data Set V1
3) Custom Maltese Braille Data Set V2

[1] https://www.pharmabraille.com/braille-codes/malta-braille-code/

The table named Data-Set Comparison show the number of characters (Chars), whether the data set supports Maltese characters, and whether the data set supports two way translation.

Table I
DATA-SET COMPARISON.

Data Set	Chars	Supports Maltese	Two Way Translation
PharmaBraille	64	No	No
Custom v1	110	Yes	No
Custom v2	220	Yes	Yes

III. RESEARCH METHODOLOGY

The first step in this research was to find someone who is proficient in Maltese braille. An interview was carried out with a teacher whose job is to support students with visual impairments. Through this interview it was made clear how the Maltese Braille system works and which characters in the Maltese Braille system differ from the international standard for Braille. The interview also shed light on the fact that the ASCII character set contains Braille characters and that these would suffice when it comes to displaying Maltese Braille. The interview resulted in the following: Maltese educators lack proper tools that could translate from Braille to Maltese and vice versa. This results in students with visual impairments having a far worse quality of education than they should.

Based on the findings of the interview it was clear that there is an issue. To solve this issue I believe that it is possible to create a Maltese text to Maltese Braille translator and vice versa. The interview itself gave a lot of insight on how this can be done. Therefore based on these findings the following solution was devised:

The main objectives are:

1) Create a Maltese text to Maltese Braille translator.
2) Create a Maltese Braille to Maltese text translator.
3) Make the translators created easily portable so that they can be implemented in multiple tools.

To achieve this, I present the following research questions:

1) Does a data set need to be created for Maltese Braille?
2) Can a translator that translates Maltese text to Maltese Braille and vice versa be created?
3) Can this translator be offered as a service so that people can use it in other projects?

Whilst braille data sets did exist, none were found that fully fit the criteria for the task at hand. As such, the data set is the first thing that was built. This data set consists of the letters of the Maltese alphabet represented in both Braille and Latin typography. It also contains some of the braille representations for punctuation.

The data set was then surrounded with logic that was created to handle special cases such as numbers, punctuation and capital letters.

After creating and testing the prototype, a second interview would be held where the interviewee would be asked to evaluate the prototype in question. The feedback given as well as an overall evaluation of the prototype would be recorded.

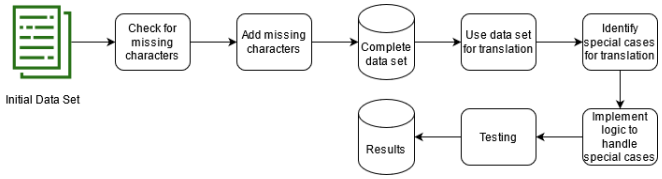

Figure 1. Research Pipeline

IV. FINDINGS & DISCUSSION OF RESULTS

The proposed solution is comprised of a data set which consists of Maltese language characters and their braille counterparts. Specific logic would then handle special cases such as numbers, punctuation and capital letters. While the solution was coded in Python, the general algorithm can be ported over into any system.

Given the nature of this research, a successful example of a grade 1 Braille translator would give correct one to one character translations a 100% of the time. While the system did manage to give correct translations every time it was given a character included in the data set, any characters that were given that weren't in the data set could not be translated. This means special characters such as: # / @ $ = could not be translated since these are not included in the data set.

The following is a transcript of the interview that was conducted after the prototype was created. It concerns the evaluation of the prototype and some other relevant information. The interviewer is me and the interviewee is Mrs. Susan Mangion who is a teacher for the visually impaired. She forms part of the National School Support Services (NSSS). The participants will be referred to as Mikel and Mrs. Mangion.

Interview Transcript:

Question 1

Mikel: "Can you tell me a bit about your experience in this sector?"

Mrs. Mangion: "I have been a teacher for 24 years. For the last 5 years I have been working as a teacher with the NSSS, providing assistance to educators and parents with visually impaired students."

Question 2

Mikel: "How useful would a tool such as this be to visually impaired students?"

Mrs. Mangion: "Such a tool could be vital to the education of visually impaired students. Since visually impaired students are in mainstream education and not in specialised schools, teachers can struggle to prepare material in a way that is accessible to the visually impaired. This is mostly due to the amount of time taken to translate to this material into braille. A translation tool could help expedite the translation process which would help teachers to be able to give educational materials to visually impaired students. This can allow the students to experience education at a closer pace to that of students who are not visually impaired."

Question 3

Mikel: "After using the prototype, how accurate do you feel the translations are?"

Mrs. Mangion: "All the sentences I entered were accurately translated. Capital letters were correctly noted, as was punctuation and numbers. As far as I can tell it always returned a correct translation."

Question 4

Mikel: "Are there any changes to the translation that you would suggest?"

Mrs. Mangion: "I would include all the punctuation that is included in the international braille standard."

Question 5

Mikel: "Any other recommendations for the prototype as a whole?"

Mrs. Mangion: "I would like to see this kind of translator on a mobile app. This would make it much easier to use for the educators. It would help save time and also provide instant verification to any translated text."

Through the interview it was made clear that the prototype works and provides accurate translations. The general feedback was that this would be a tool that can greatly help Maltese educators when dealing with visually impaired students. The biggest recommendation was to include more punctuation as this would help make the translator more usable in a larger variety of scenarios. Some other recommendations that were made pertain to making the translator easier to use, (E.g. creating a mobile app that could read text and return translated braille characters.) If the translator were easier to use it would help speed up the process of translation for educators.

V. Conclusion

The aim of this paper was to research whether a grade 1 Maltese to Maltese Braille translator, and vice versa, could be created. To achieve this, a new custom data set consisting of Maltese characters and their corresponding braille counterparts had to be created. This data set was then surrounded with logic that would handle special cases such as capital letters and numbers. This method is very lightweight since it does not require a lot of processing power and the translations occur very quickly. The algorithm is versatile and can be implemented in multiple different programming languages. Although the prototype was not created in a way where it can be offered as a service so that it can be used in other projects, this algorithm can easily be fashioned into the form of an API. The API could function in a way where one can give it text to translate and it would return the translated text.

For future research, one can take the algorithm presented and integrate it into multiple tools that could be used within an educative setting. The effect of these tools can then be measured and documented so that one can determine the effectiveness of different tools. Future research can also investigate the interactions between educators and visually impaired students and whether the aforementioned tools can help make these interactions more positive.

Acknowledgement

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