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A Semi-Automated Lyrics Generation Tool for Mauritian Sega

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ABSTRACT

In this paper, we give an overview of how Sega lyrics, in Mauritian Creole language, are being written by Mauritian Lyricists and a tool which has been developed to automatically generate Sega lyrics. Research shows that song writing is not always an easy task. Someone cannot be told exactly how to write lyrics, but that does not mean there are not ways in which he/she can learn to do it better. In-depth analysis has been carried out on Natural Language Processing, Text Mining, Machine Learning and existing Sega lyrics to consolidate the foundation of the project. Interviews have been done with a domain expert to learn the process of conventional song writing. Thus a tool, Paroles Sega Morisien, was developed. Paroles Sega Morisien enables users to generate Sega lyrics from randomly selected Mauritian Creole keywords. It is the first time that such a tool has been developed. An evaluation, consisting of a comparability study, was carried out to compare existing lyrics against lyrics generated by the tool. The result obtained was favorable.

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1. INTRODUCTION

Music is one of the most important forms of art in a society. It has the major role of uniting people of different ages, ethnic groups and races. It provides the basis for mutual understanding and acceptance among different people. Each country has its own type of music and songs. Many people seek career in the music industry as it is a very promising field. However, it is believed that the most important aspect which is required in this field is talent. Undoubtedly, to compose music and to write songs require a considerable amount of skill.

The “Sega” is the major form of art of the Mascarene islands; Mauritius, Reunion and Rodrigues, and Seychelles. Sega consists of the song, the music and the dance. Jacques Lee explains that Sega goes back at least to the early 18th century when it evolved as the soul dance of the African slaves as a form of escapism from the harsh reality of their daily lives. After a long week toiling in the sugarcane fields, they would gather around a fire drinking ‘alambic’, an alcoholic beverage. Once fuelled by the rum, they became less inhibited and started to sing and dance, which became known as the Sega. The original Sega instruments were made from anything the slaves could lay their hands on. The ‘ravan’ (a goatskin tambour), ‘maravan’ (a hollowed out tube filled with dried seeds) and ‘triang’ (a triangular-shaped piece of old iron) were played,

along with anything else that could produce a sound. Nowadays, the 'ravan', 'maravan' and 'triang' are still played, but modern instruments like guitars and keyboards are also used. In the past, these songs were a way for slaves to express their feelings and vent their anger on their masters, whom they ridiculed in their lyrics. Over the last decade, the Sega has found itself in a state of flux, where it has been constantly developing and embracing different styles of music. However, the Sega is still a great medium to convey stories and myths, through its lyrics [8].

In his article, Sam Inglis states that writing a song is the main and the most challenging task of many singers. Lyrics of a song should be striking and in the music, there should be something to attract the audience to listen to it. Writing the words of songs is often thought of as a process of pure intuition, but there is a lot more to it than that. Many people think song-writing is a craft that cannot be taught. After all, it is often a matter of finding expression for very personal ideas and themes; and beyond the traditional instructions to write about what you know, people are often reluctant to give or receive advice. People cannot be told exactly how to write lyrics, but that does not mean there are not ways in which you can learn to do it better [16].

Music, song-writing and singing are now becoming opportunities as a career in Mauritius, like it is in other countries. Various software are used in every type of business nowadays. However, software is not widely used in the music industry, more specifically in the lyrics sector. The fact that it is believed that writing songs requires talent, it becomes rather difficult to build a software to assist lyricists in writing songs.

The rest of the paper is organized as follows. In section II, a comprehensive coverage of the use of Natural Language Processing is done in the area of text generation tools. In section III, we discuss about the preliminary studies done prior to building the system. Section IV discusses about the implementation of the tool to provide assistance to lyricists in their work and its evaluation. Section V concludes the paper.

2. LITERATURE REVIEW

2.1. Automatic letter Composition (Intelligent Correspondence Generator – ICG)

Springer, Buta and Wolf built the Intelligent Correspondence Generator (ICG) system that has enhanced the quality and reduced the complexity with the quick production of its customized letters. Users with very little or no training in business correspondence can use the system to automatically generate high-quality letters.

The ICG makes use of an existing client's database that store all the information needed. The information is placed on a blackboard based expert system and inference rules are run to organize the information. Template rules are used to determine the basic structure of a letter. Based on the templates selected, generation rules are used to perform lower level text planning and realization to build a complete letter. The letter is then formatted and presented in a Microsoft Word document.

To ensure quality letter, their system consisted of a Customer Service Representative whose job was to review and modify the generated text before it was presented as a formatted letter. Thus, the problem of presenting letters that have no sense was avoided and successfully handled [17].

2.2. Tra-la-Lyrics: An approach to generate text based on rhythm

In this project, Oliveira, Cardoso and Pereira created a software capable of generating lyrics for a given set of melodies. The main objective of their system was to generate lyrics that would rhyme with some pre-defined melodies. For that, they studied the words and rhythm in a song's lyrics to achieve some heuristics. They used a relational database that stored the words, their grammatical category and some morphological attributes. As their main objective was to make the words generated rhyme with the melodies, the lyrics generated were not of reasonable quality.

However, Oliveira *et al*. argue that a better way to evaluate the output of their system would be to have a considerable amount of people answering questionnaires, where they would be asked to compare existing lyrics to generated lyrics [10].

In another revised paper, Oliveira *et al*. attempted to explore different strategies for automatic generation of song lyrics for rhyming with melodies. They managed to achieve their main objective of exploring improved ways of generating text that would rhyme better and successfully evaluated their system using an online evaluation inquiry for 70 people [11].

2.3. Difficulties and Challenges in Automatic Poem Generation: Five Years of Research at UCM

Gervas and Hervas reviewed works on automatic poem generation and outlined the difficulties and challenges that were faced. Gervas *et al*. talk about the WASP (Wishful Automatic Spanish Poet) system as a first tool for poem generation. WASP was used to compose formal poetry in Spanish in a semi-automatic interactive fashion. Its basis was a forward reasoning rule-based system that obtained information from users and used them as parameters. The system then applied a knowledge-based pre-processor to select the most appropriate metric structure for the user's wishes. In the composition process, WASP combined natural language generation and artificial intelligence techniques to apply a set of construction heuristics obtained from formal literature on Spanish poetry.

However, in the end, its results were always judged as poor by the human evaluators. To address this problem, Gervas *et al*. explain how these poor results can be rectified.

Gervas *et al*. argue that "managing vocabulary" is of vital importance to achieve successful results in the future. The authors explain how the ability to store and manipulate words in a convincing manner can enable a poet to better generate meaningful poems. From these studies, it was concluded that a good flow of words that relate to each other was of utmost importance. Hence, in the system, a thesaurus option was provided for generating lyrics automatically using synonyms [4].

2.4. Rap Lyrics Generator

Rap Lyric Generator was developed by Hieu Nguyen and Brian. It takes a collection of song lyrics and outputs a song based on words from the collection. For its implementation, it used a MySQL database to store thousands of existing lyrics and the contents were split into verses and choruses. Then, a rhyming database was used to produce words that rhymed with a given input word. Finally, a sentence generation was used to piece together each section of the song according to some predefined song structure (verse-chorus-verse-chorus).

However, the problem with this generator is that lines that are generated do not relate to a specific theme. For instance, one line may be talking about love, and the other may be talking about sports. Another problem is on rhymes. The last word of the line does not always rhyme with the last word of the previous line. On a brighter side, the objective of keeping 8 or 9 words per line has been achieved at 47% [13].

2.5. Narrative Prose Generation

This approach of narrative prose generation was implemented in Storybook, a narrative prose generator and it is the first Natural Language Generation System which has been developed to reproduce the complex phenomena of human-generated stories. The main objective of Charles, Callaway and Lester was to bridge the gap between story generators and Natural Language Generation systems, so that it can create high-quality stories comparable to the ones routinely produced by human authors. This architecture has been implemented in a narrative prose generation system that uses narrative planning, sentence planning and a dialogue history [1].

2.6. Automatic Prediction of Hit Songs

Ruth Dhanaraj and Beth Logan investigated on the automatic analysis of music to identify possible hit songs, in other words, songs which might be very successful. Ruth Dhanaraj *et al.* extracted both audio and lyric information from each song and separated "hits from non-hits using standard classifiers, specifically Support Vector Machines and boosting classifiers". Lyrics were studied as they are thought to be a large part of what makes a song a hit. Lyrics were obtained freely from online repositories. However, many of them were not standardized or in a proper format for processing. Ruth Dhanaraj *et al.* used the Astraweb Lyrics Search site as it was a site with standardized pages. Data from this site were used for analyzing lyrics. An overall of 47000 songs were obtained. HTML tags, advertising and excess information were stripped off, so that raw lyrics of the songs could be obtained. However, for both audio and lyrics data all together, 91 songs were obtained. Analysis was then carried out on both of them. The results indicated that lyric-based analysis is somewhat more effective than audio-based analysis at determining success of songs [15].

2.7. Other Text Generator Systems

More researches were done on several authors' works. Ramakrishnan, Kuppan and Lalitha worked on a program to generate Tamil lyrics for a given melody. However, the main problem was that the lyrics generated were meaningless as the focus was mainly on rhyming with a melody [14]. In another research, it was found out that Delgado, Fajardo and Solana provided a new approach to compose music using computers. They employed expert system technologies for the composition process [2].

A poetry generation system was built by Greene, Bodrumlu and Knight. Statistical methods were employed to analyze, generate, and translate rhythmic poetry. They applied unsupervised learning to reveal word-stress patterns in a corpus of raw poetry [5]. Previously, Hugo talked about automatic generation of creative text, more precisely the automatic generation of poetry as being a very complex task. Two different categorizations of poetry generation systems were presented and actual systems were described [12].

2.8. Related Applications

In this section, we studied the different text generation systems that already exist and briefly outline their strengths and weaknesses.

Love Poem Generator (www.links2love.com/poem_generator.htm/)

Love Poem Generator is an online tool that allows users to automatically generate poems. The user has to enter words into a form and the system uses a pre-defined template to generate a poem. The words entered by the user are replaced in the template. Several forms are available where the user can make their choices. However, almost all poems generated have the same format since they all use the same template and only keywords are replaced. Additionally, there are no proper indications about the words to be entered. Consequently, the poem can result in not making any sense at all.

Western Lyrics Generator Tool (http://www.outofservice.com/country/)

Western Lyrics Generator generates lyrics of song type 'Country'. There is no input to be done at all. The lyrics structure is varied and user has to click a button to generate new lyrics. The words are shuffled and replaced. Despite no input from user, there are still a very large number of possible combinations of lyrics that can be generated. However, the lyrics are very similar to each other and they are purely random. They cannot be customized to meet the need of a specific user.

Intelligent Essay Assessor (http://www.pearsonkt.com/prodIEA.shtml)

Intelligent Essay Assessor (IEA) automatically assesses and critiques essays which are submitted electronically. It provides assessment and instructional feedback useful in different subject areas. IEA is a back-end service using a web interface to evaluate essays. IEA provides an immediate overall evaluation as

well as feedback on specific traits, spelling, and grammar errors. The "IEA uses Knowledge Analysis Technologies (KAT) engine, a patented technology based on over twenty years of research and development. The KAT engine is based on Latent Semantic Analysis, a computational technique that provides a sophisticated analysis of text. It assesses the content of an essay by comparing it against a set of essays previously scored by expert human readers". However, many errors may still remain undetected [7].

3. PRELIMINARY STUDIES

Computer programs are used to assist people in every business. In order to find out how software can be integrated in the field of lyrics, in-depth analysis had to be done. Brainstorming sessions were done with a subject matter expert, who is a professional song-writer and singer. The aim of this analysis was to gain knowledge about the components of existing lyrics.

3.1. Form of Lyrics

Firstly, the form of the lyrics was studied. The form consists of the structure of the lyrics. Verse-chorus-verse-chorus is an example of form. Gary Ewer and B.Mus state that with no form, the lyrics will tend to have no shape and no direction. To be a success, all songs need at least a simple form [3]. An analysis of the lyrics "Reason" by King, a Mauritian Sega author/singer has been carried out. The original lyrics are in Mauritian Creole Language. It has been translated to English Language so that it can be understood by readers.

Mauritian Creole	***English Translation***
(VERSE)	*(VERSE)*
Sans toi mo lavie nepli ena raison	*Without you my life has no reason*
Sans toi mo lavie nepli ena raison	*Without you my life has no reason*
Gramatin tanto mo le coeur li troubler	*Day and night my heart is troubled*
Gramatin tanto mo le coeur li troubler	*Day and night my heart is troubled*
(CHORUS)	*(CHORUS)*
To presence dans mo la vie	*Your presence in my life*
Donne mwa la force pu mo diboute	*Gives me strength to stand*
To presence dans mo la vie	*Your presence in my life*
Donne mwa la force pu mo diboute	*Gives me strength to stand*
Mo lamain dan to lamain	*My hands in your hands*
Donne mwa couraz pu mo avancer	*Give me courage to move on*
Mo lamain dan to lamain	*My hands in your hands*
Donne mwa couraz pu mo avancer	*Give me courage to move on*

The verse is repeated exactly as it is three times, and the chorus is repeated five times in the song. There are only six unique phrases throughout the whole song. The six unique phrases are:

Mauritian Creole	***English Translation***
Sans toi mo lavie nepli ena raison	*Without you my life has no reason*
Gramatin tanto mo le coeur li troubler	*Day and night my heart is troubled*
To presence dans mo la vie	*Your presence in my life*
Donne mwa la force pu mo diboute	*Gives me strength to stand*
Mo lamain dan to lamain	*My hands in your hands*

Donne mwa couraz pu mo advancer	*Give me courage to move on*

The form of the song is: Verse-chorus-verse-chorus-verse-chorus-chorus-chorus. The repetition of the verse and chorus make it uninteresting to listen to the song. This could be an example of a wrong choice for the song structure. Gary Ewer *et al.* believe that a wrong choice for song structure make the audience believe that the songwriter did not have ideas of what to include in the song [3]. Full lyrics of the song "Reason" is available in Appendix A.

3.2. Quantitative Analysis

Secondly, an analysis was carried out on 15 existing lyrics. This analysis focused mainly on the quantitative aspect of the lyrics, that is, the number of words, number of phrases, etc. The average was then calculated. The table below shows the result:

Table 1: Quantitative Analysis of Existing Lyrics

Element	**Average**
Total No. of words	355
No. of unique words	59
Total No. of phrases	65
Average No. of words per phrases	5.4
No. of words in chorus	39
Frequency of chorus	5
Average No. of words in verse	50
Frequency of verse	3

3.3. Grammar Usage

Finally, the grammar usage was analyzed in the 15 existing lyrics. The grammar consisted of the nouns, pronouns, adjectives, adverbs, verbs, articles and conjunctions present in the lyrics.

It can be observed that verbs and nouns are the two most common occurrences in the lyrics, followed by adjectives, adverbs, pronouns, prepositions and conjunctions. Articles and names are the least common occurrence. The pie chart below illustrates the grammar usage in existing lyrics:

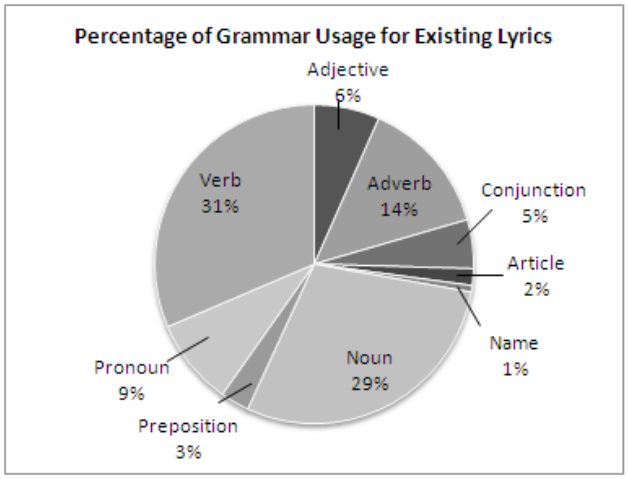

Figure 1: Grammar Usage for Existing Lyrics

4. PAROLES SEGA MORISIEN: SYSTEM DESCRIPTION

4.1. Implementation

Our system is implemented in PHP: Hypertext Preprocessor and uses MySQL as a database engine. It is the first time that a tool has been developed to generate meaningful lyrics, without the use of a pre-defined template. It provides the main functionality of generating lyrics. The basic inputs of our system are words entered in Mauritian Creole Language. There are different categories of lyrics. Users have to choose a category and then enter words into the form provided by the system. Hints about which word to enter will be given. An example of an input is a 'body part'. The form which has to be filled by the user contains both mandatory fields and optional fields. The words which have been entered will be stored in a table. The form also consists of a space where phrases can be entered. Once the form is filled, it has to be submitted. Below is an example of a form:

Figure 2: Example of a form

The process of semi-random selection then begins. The selection of phrases for the lyrics is based on the words entered by the user. The words will be used as *keywords* to search into the database. Corresponding phrases will be given so that the lyric is related to the words entered. If the user has entered a name of a person, the name will form part in the lyrics. Additionally, if the user has entered a phrase, the phrase will also form part in the lyrics.

After a couple of stages, a suitable lyrics will be generated, with an appropriate structure, that is, a proper number of choruses and verses. The lyrics will be displayed in an editable format, so that users can do modifications instantly before saving.

The Database

The database is made up of tables for each category of lyrics and for the different grammatical features, like nouns, verbs, etc. As a source of words for the system, a Word Proposition feature has been set up. It gives users the opportunity to propose new words and phrases to continuously feed the system.

4.2. Evaluation

Comparability Study of Lyrics

Five lyrics generated by the system have been assessed in the same way which was done with existing lyrics. The next step was to compare the lyrics generated against existing lyrics. The table below illustrates the result (in terms of average) obtained after analyzing both generated lyrics and existing lyrics.

Table 2: Comparison between Generated and Existing Lyrics

Element	Generated Lyrics	Existing Lyrics
Total No. of words	238	355
No. of unique words	48	59
Total No. of phrases	51	65
Average No. of words per phrases	4.6	5.4
No. of words in chorus	33	39
Frequency of chorus	4	5
Average No. of words in verse	43	50
Frequency of verse	3	3

Grammar Usage Comparison

A grammar usage analysis was also carried out on the five generated lyrics so as to compare against existing lyrics. The pie charts below illustrate the differences.

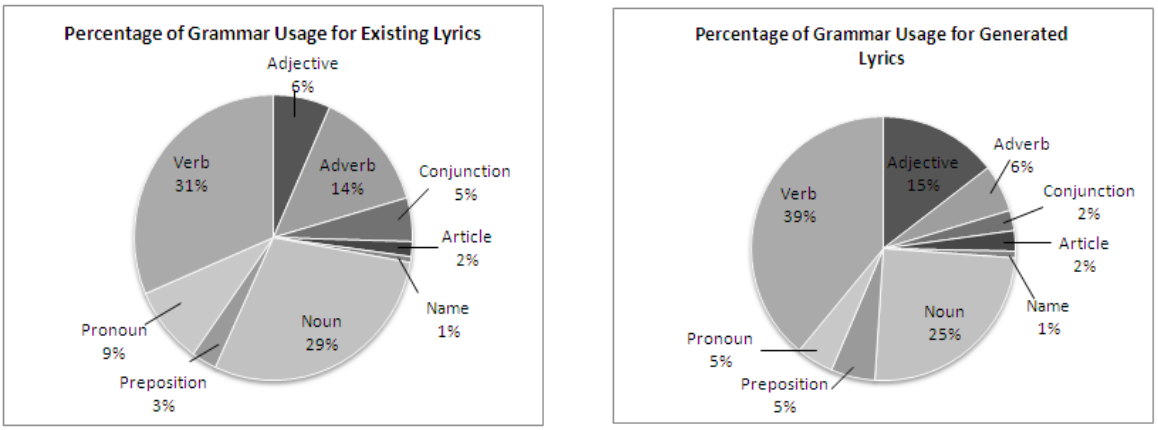

Figure 3: Grammar Usage Comparison

It can be observed that in both existing and generated lyrics, verbs and nouns are the two most common occurrences, followed by adjectives, adverbs, pronouns, prepositions and conjunctions. Articles and names are the least common occurrence in both of them.

User Evaluation

A survey was done, targeting 100 people of Mauritian nationality. There were 63 respondents. The survey consisted of making people choose between lyrics generated by the system and lyrics written by professional singers. Ten lyrics were provided; among which some were existing ones and some were generated by Paroles Sega Morisien. They were shuffled and their titles were removed on purpose. People were asked to judge which ones were existing and which ones were semi-generated. A very encouraging result was obtained as illustrated in the tables below.

Table 3: Existing Lyrics Evaluation

	Song Title	They said Existing Lyrics	They said Semi-Generated
Existing Lyrics	Angelina	64.71%	35.29%
	Mo Sentimen Pu Twa	63.93%	36.07%
	Premier Lamour	68.00%	32.00%
	Explanation of statistics for *Angelina, Mo Sentimen Pu Twa* and *Premier Lamour* The percentage of people who rightly guessed that the above three lyrics were existing ones closely matched, i.e. **64.71%**, **63.93%**, **68.00%**. All of them are above **50%**. The reason behind these high figures might be because of their popularity. People have already heard them playing several times, thus it was easier to guess that they are existing ones.		
	Song Title	**They said Existing Lyrics**	**They said Semi-Generated**
	Premier Fois	36.00%	64.00%
	Beni Nu Lamour	45.10%	54.90%
	Explanation of statistics for *Premier Fois* and *Beni Nu Lamour* The percentage of people who guessed that the above two lyrics were semi-generated ones are **64.00%** and **54.90%**, when in fact the lyrics were existing ones. In-depth analysis shows that the reason behind this high percentage might be because of the contents of the lyrics. Both of the above lyrics contain contents which are less narrative in nature, that is, more randomness was noticed. Also, the words and phrases are quite repetitive.		

Table 4: Generated Lyrics Evaluation

	Song Title	They said Existing Lyrics	They said Semi-Generated
Semi-Generated Lyrics	Merci Pou To Soutient	53.75%	46.25%
	Retourne Dan Mo Lavi	51.25%	48.75%
	La Haut Dan Le Ciel	49.00%	51.00%
	Explanation of statistics for *Merci Pou To Soutient, Retourne Dan Mo Lavi* and *La Haut Dan Le Ciel* The percentage of people who said that the above three lyrics were existing are **53.75%, 51.25%** and **49.00%,** when in fact these lyrics were generated ones. The average is **51.33%.** This shows that the lyrics generated by Paroles Sega Morisien are good enough to be interpreted as existing lyrics.		
	Song Title	**They said Existing Lyrics**	**They said Semi-Generated**
	Linzy	44.73%	55.27%
	Mo Serr	42.00%	58.00%
	Explanation of statistics for *Linzy* and *Mo Serr* The percentage of people who said that the above two lyrics were existing ones are **44.73%** and **42.00%.** In fact, they are semi-generated ones and the percentage shows that above **50%** guessed it right. The reason behind this high percentage who thought that the lyrics are generated ones might be because of the repetition which occurred in the lyrics **Linzy.** Concerning **Mo Serr** lyrics, the reason might be because the category of songs for siblings is less common.		

The table below shows the average of Existing Lyrics Evaluation and Semi-Generated Lyrics Evaluation.

Table 5: Average Lyrics Evaluation

	They said Existing Lyrics	**They said Auto-Generated**
Existing Lyrics	55.55%	44.45%
Semi-Generated Lyrics	48.15%	51.85%

The above table shows that:

- **48.15%** people thought that semi-generated lyrics were written by human beings.
- **44.45%** people thought that existing lyrics were generated ones.

These closely related figures explain the fact that Sega lyrics can be actually be generated by a computer program. They can be imitated and the results obtained are satisfactory.

5. CONCLUSION

Music, song-writing and singing are now becoming opportunities as a career in Mauritius, like it is in other countries. Various software are used in every type of business nowadays. The aim is to show that song-writing can also be supported by software. Paroles Sega Morisien was therefore developed. Paroles Sega Morisien is a tool which is intended to facilitate people who have stepped up into the music industry to create a career. It mimics the traditional way of writing Sega lyrics to its best.

It is the first time that such a tool has been developed. It generates meaningful lyrics, without the use of pre-defined templates. For the time-being, it is semi-generated, because some words have to be entered in order to generate lyrics. In the future, the system can further be enhanced such that it is completely automated and no user input is required.

The success of the software lies in its ongoing work. Indeed, the database of the system has to be constantly fed with words and phrases so that the variety of lyrics generated keep on increasing. Text Mining technique is a concept which can be adopted in the future to extract Mauritian Creole words and phrases from documents and websites to feed the database.

Appendix A. Full lyrics of song "Reason"

Mauritian Creole	***English Translation***
(VERSE)	*(VERSE)*
Sans toi mo lavie nepli ena raison	*Without you my life has no reason*
Sans toi mo lavie nepli ena raison	*Without you my life has no reason*
Gramatin tanto mo le coeur li troubler	*Day and night my heart is troubled*
Gramatin tanto mo le coeur li troubler	*Day and night my heart is troubled*
(CHORUS)	*(CHORUS)*

To presence dans mo la vie	*Your presence in my life*
donne mwa la force pu mo diboute	*Gives me strength to stand*
To presence dans mo la vie	*Your presence in my life*
donne mwa la force pu mo diboute	*Gives me strength to stand*
Mo lamain dan to lamain	*My hands in your hands*
donne mwa couraz pu mo avancer	*Give me courage to move on*
Mo lamain dan to lamain	*My hands in your hands*
donne mwa couraz pu mo avancer	*Give me courage to move on*
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Mo lamain dan to lamain	*My hands in your hands*
donne mwa couraz pu mo avancer	*Give me courage to move on*

Table 6: Full lyrics of "Reason" with English Translation

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