



XVIIth World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)

Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010



A MULTI-LINGUAL TRANSLATION ENGINE FOR TRANSLATING RATION FORMULATION PROGRAMS FROM ENGLISH TO SPANISH, PORTUGUESE, ITALIAN, GERMAN, AND FRENCH LANGUAGES

A. AHMADI¹, P.H.ROBINSON¹, P. CHILIBROSTE²

¹ A. Ahmadi, Department of Animal Science, University of California, One Shields Ave, Davis, CA 95616, USA, AbAhmadi@ucdavis.edu

² P. Chilibroste, Ingeniero Agrónomo, Andes 1365 P.12, Montevideo, Uruguay

CSBE101638 – Presented at the 8th World Congress on Computers in Agriculture (WCCA) Symposium

ABSTRACT A multi-lingual translation engine was developed to translate the existing ration formulation programs from English to Spanish, Portuguese, Italian, German, and French languages. The Engine consists of two modules: The first module is a scanning module that scans the source code of the target program written in C++ language and extracts all the English phrases and saves them in a dictionary in Excel spreadsheet format. The dictionary has a column for the scanned English phrase and another blank column for the translation of that phrase. The dictionary also tracks the file name and the line number of each phrase. This dictionary is then forwarded to an expert translator to translate all English phrases into the target language. The second module is a translation module, which uses the translated dictionary and scans the source code written in C++ programming language and replaces all the English phrases with translated phrases. The final step is to re-compile the translated source code and to create a new program in the target language. Currently we are using this approach to translate our dairy cattle ration program, PCDAIRY, from English to Spanish.

Keywords: Multilingual, Translation Knowledge Management, Semantics, Text Mining

INTRODUCTION

We have developed a series of ration formulation programs for dairy cattle (Pcdairy), beef cattle (Taurus), sheep (Aries), goats (Capricorn), horses (Pegasus), and pigs (Apollo). All these programs are written in the C++ programming language and are developed in English language for English-speaking audiences in the United States of America. As our software programs distributed all over the world, there was a need to translate our ration program into other languages, especially to Spanish, Portuguese, Italian, German, and French Languages.

A multi-lingual translation engine is developed to translate the existing ration formulation programs from English to Spanish, Portuguese, Italian, German, and French languages. The Engine consists of two modules: The first module is a scanning module which scans the source code of the target program written in C++ language and extracts all the

English phrases and saves them in a dictionary in Excel spreadsheet format. The dictionary has a column for the scanned English phrase and another blank column for the translation of that phrase. The dictionary also tracks the file name and the line number of each phrase. This dictionary is then forwarded to an expert translator to translate all English phrases into the target language. The second module is a translation module, which uses the translated dictionary and scans the source code written in C++ programming language and replaces all the English phrases with translated phrases. The final step is to re-compile the translated source code and to create a new program in the target language. Currently we are using this approach to translate our dairy cattle ration program, PCDAIRY, from English to Spanish.

METHODS To demonstrate the power of the Multilingual Translation Engine, the grazing dialog box of the dairy cattle ration program, Pcdairy, is used. Figure 1 shows the grazing dialog box in English language.

Figure 1. Grazing dialog box in English language.

The source code for this module is shown in the Figure 2. Note that the English phrases are marked red.

```

Microsoft Visual C++ - [DlgPasture.cpp]
File Edit View Insert Project Build Tools Window Help

//-----
// GROUP_NAME
//-----
plbl = (CStatic*)this->GetDlgItem(IDC_LBL_GROUP_NAME);
plbl->SetWindowText("Group Name:");

def_pic(pic, 'x', COW_GROUP_NAME_MAX);
pedt = (CEdit*)this->GetDlgItem(IDC_EDT_GROUP_NAME);
SetEdtControl(pedt, pic, pasture->strGroupName);

//-----
// PASTURE_TYPE
//-----
plbl = (CStatic*)this->GetDlgItem(IDC_LBL_PASTURE_TYPE);
plbl->SetWindowText("Pasture Type:");

pcbo = (CComboBox*)this->GetDlgItem(IDC_CBO_PASTURE_TYPE);

// build the list
pcbo->ResetContent();
i = 0;
szText = "1. Grass Based Pasture";
pcbo->InsertString(i, szText);

i++;
szText = "2. Mixed Grass-Legume Based Pasture";
pcbo->InsertString(i, szText);

i++;
szText = "3. Legume Based Pasture";
pcbo->InsertString(i, szText);

// Set the selection
nCurSel = pasture->nPastureType -1; // elements are zero-based
SetCboControl(pcbo, nCurSel);

//-----
// PASTURE_QUALITY
//-----
plbl = (CStatic*)this->GetDlgItem(IDC_LBL_PASTURE_QUALITY);
plbl->SetWindowText("Pasture Quality:");

```

Figure 2. Source code for the grazing dialog box with English phrases.

The Multilingual Translation Engine scans the source code and extracts all the English phrases enclosed in a pair of double quotation marks. It saves all the extracted phrases in a multilingual dictionary (Figures 3a and 3b).

The multi-lingual dictionary has a column for English phrases and another column for the target language, in this example, Spanish. This dictionary is forwarded to an expert translator for translation from English to Spanish. For example the 2nd phrases, “Group Name:” is translated in Spanish as “Nome do Grupo:”. The Multilingual Translation Engine uses this dictionary to find the English phrases in the source code and to replace them with the Spanish translation. The translated source code, then, is re-compiled to create the Spanish version of the grazing dialog box shown in Figure 4.

Using the similar method, the Portuguese and French versions of the grazing module are generated (Figures 5 and 6).

CONCLUSION The multi-lingual translation engine can be used to translate our ration formulation programs, as well as other programs written in the C or C++ programming languages. It is simple and straightforward and does not increase the size of compiled programs or their performance.

APPENDIX A

A	B	C	D	E	F	G	
1	No	LineNo	EngLen	SpnLen	FileName	English	Spanish
2	1	102	13	14	DlgPasture.cpp	[GRAZING: %s]	[Pastoreo:% s]
3	2	140	13	19	DlgPasture.cpp	[Group Name:]	[Nombre del grupo:]
4	3	150	15	17	DlgPasture.cpp	[Pasture Type:]	[Tipo de pastos:]
5	4	157	24	35	DlgPasture.cpp	[1. Grass Based Pasture]	[1. Basada en los pastos de hierba]
6	5	161	37	51	DlgPasture.cpp	[2. Mixed Grass-Legume Based Pasture]	[2. Césped mixto basado en pasturas de leguminosas]
7	6	165	25	32	DlgPasture.cpp	[3. Legume Based Pasture]	[3. Leguminosas forrajeras base]
8	7	176	18	26	DlgPasture.cpp	[Pasture Quality:]	[Calidad de las pasturas:]
9	8	183	25	27	DlgPasture.cpp	[1. High Quality Pasture]	[1. Pastos de alta calidad]
10	9	187	27	32	DlgPasture.cpp	[2. Medium Quality Pasture]	[2. Los pastos de calidad media]
11	10	191	24	31	DlgPasture.cpp	[3. Low Quality Pasture]	[3. Los pastos de baja calidad]
12	11	203	15	19	DlgPasture.cpp	[Pasture Mass:]	[Masa de pasturas:]
13	12	212	15	10	DlgPasture.cpp	[kg DM/hectare]	[kg MS/ha]
14	13	214	12	12	DlgPasture.cpp	[lb DM/acre]	[lb MS/acre]
15	14	221	26	30	DlgPasture.cpp	[Number of Cows in Group:]	[Número de vacas en el grupo:]
16	15	230	6	7	DlgPasture.cpp	[cows]	[vacas]
17	16	232	6	7	DlgPasture.cpp	[cows]	[vacas]
18	17	239	33	43	DlgPasture.cpp	[Paddock Size for Group of Cows:]	[Tamaño de Paddock para el grupo de vacas:]
19	18	248	9	10	DlgPasture.cpp	[hectare]	[hectárea]
20	19	250	6	6	DlgPasture.cpp	[acre]	[acre]
21	20	258	26	35	DlgPasture.cpp	[Morning Grazing Session:]	[Período de pastoreo de la mañana:]
22	21	267	11	11	DlgPasture.cpp	[hours/day]	[horas/día]
23	22	269	11	11	DlgPasture.cpp	[hours/day]	[horas/día]
24	23	277	26	35	DlgPasture.cpp	[Morning Grazing Session:]	[Período de pastoreo de la mañana:]
25	24	286	11	11	DlgPasture.cpp	[hours/day]	[horas/día]

Figure 3a. Multi-lingual dictionary (English-Spanish)

A	B	C	D	E	F	G	
1	No	LineNo	EngLen	PorLen	FileName	English	Portuguese
2	1	102	13	13	DlgPasture.cpp	[GRAZING: %s]	[Pastejo:% s]
3	2	140	13	16	DlgPasture.cpp	[Group Name:]	[Nome do Grupo:]
4	3	150	15	19	DlgPasture.cpp	[Pasture Type:]	[Tipo de Pastagem:]
5	4	157	24	27	DlgPasture.cpp	[1. Grass Based Pasture]	[1. pastagem de capim-base]
6	5	161	37	39	DlgPasture.cpp	[2. Mixed Grass-Legume Based Pasture]	[2. legume erva misturada com pastagem]
7	6	165	25	32	DlgPasture.cpp	[3. Legume Based Pasture]	[3. leguminosas forrageiras com]
8	7	176	18	24	DlgPasture.cpp	[Pasture Quality:]	[Pastagem de qualidade:]
9	8	183	25	31	DlgPasture.cpp	[1. High Quality Pasture]	[1. Alta qualidade da pastagem]
10	9	187	27	32	DlgPasture.cpp	[2. Medium Quality Pasture]	[2. Média qualidade da pastagem]
11	10	191	24	32	DlgPasture.cpp	[3. Low Quality Pasture]	[3. Baixa qualidade da pastagem]
12	11	203	15	17	DlgPasture.cpp	[Pasture Mass:]	[Pastagem Massa:]
13	12	212	15	13	DlgPasture.cpp	[kg DM/hectare]	[kg de MS/ha]
14	13	214	12	12	DlgPasture.cpp	[lb DM/acre]	[DM lb/acre]
15	14	221	26	27	DlgPasture.cpp	[Number of Cows in Group:]	[Número de vacas no grupo:]
16	15	230	6	7	DlgPasture.cpp	[cows]	[vacas]
17	16	232	6	7	DlgPasture.cpp	[cows]	[vacas]
18	17	239	33	38	DlgPasture.cpp	[Paddock Size for Group of Cows:]	[Paddock tamanho para grupo de vacas:]
19	18	248	9	9	DlgPasture.cpp	[hectare]	[hectare]
20	19	250	6	6	DlgPasture.cpp	[acre]	[Acre]
21	20	258	26	26	DlgPasture.cpp	[Morning Grazing Session:]	[Sessão da manhã Pastejo:]
22	21	267	11	11	DlgPasture.cpp	[hours/day]	[horas/dia]
23	22	269	11	11	DlgPasture.cpp	[hours/day]	[horas/dia]

Figure 3b. Multi-lingual dictionary (English-Portuguese)

Pasture_English2French.xls [Compatibility Mode] - Microsoft Excel							
Home Insert Page Layout Formulas Data Review View Developer Add-Ins Acrobat							
A3 fx 2							
A	B	C	D	E	F	G	
1	No	LineNo	EngLen	FrnLen	FileName	English	French
2	1	102	13	14	DlgPasture.cpp	[GRAZING: %s]	[Pâturage:% s]
3	2	140	13	16	DlgPasture.cpp	[Group Name:]	[Nom du groupe:]
4	3	150	15	16	DlgPasture.cpp	[Pasture Type:]	[Pâturage Type:]
5	4	157	24	36	DlgPasture.cpp	[1. Grass Based Pasture]	[1. Sur la base d'herbe de pâturage]
6	5	161	37	62	DlgPasture.cpp	[2. Mixed Grass-Legume Based Pasture]	[2. Mixte herbes et de légumineuses Sur la base des pâturages]
7	6	165	25	44	DlgPasture.cpp	[3. Legume Based Pasture]	[3. Sur la base de légumineuses de pâturage]
8	7	176	18	23	DlgPasture.cpp	[Pasture Quality:]	[Pâturages de qualité:]
9	8	183	25	32	DlgPasture.cpp	[1. High Quality Pasture]	[1. Haute qualité des pâturages]
10	9	187	27	33	DlgPasture.cpp	[2. Medium Quality Pasture]	[2. Medium qualité des pâturages]
11	10	191	24	33	DlgPasture.cpp	[3. Low Quality Pasture]	[3. Faible qualité des pâturages]
12	11	203	15	16	DlgPasture.cpp	[Pasture Mass:]	[Pasture Masse:]
13	12	212	15	13	DlgPasture.cpp	[kg DM/hectare]	[kg de MS/ha]
14	13	214	12	12	DlgPasture.cpp	[lb DM/acre]	[DM lb/acre]
15	14	221	26	34	DlgPasture.cpp	[Number of Cows in Group:]	[Nombre de vaches dans le groupe:]
16	15	230	6	8	DlgPasture.cpp	[cows]	[vaches]
17	16	232	6	8	DlgPasture.cpp	[cows]	[vaches]
18	17	239	33	42	DlgPasture.cpp	[Paddock Size for Group of Cows:]	[Taille Paddock pour le groupe de vaches:]
19	18	248	9	4	DlgPasture.cpp	[hectare]	[ha]
20	19	250	6	6	DlgPasture.cpp	[acre]	[acre]
21	20	258	26	30	DlgPasture.cpp	[Morning Grazing Session:]	[Séance du matin le pâturage:]
22	21	267	11	13	DlgPasture.cpp	[hours/day]	[heures/jour]
23	22	269	11	13	DlgPasture.cpp	[hours/day]	[heures/jour]
24	23	277	26	30	DlgPasture.cpp	[Morning Grazing Session:]	[Séance du matin le pâturage:]

Figure 3c. Multi-lingual dictionary (English-French)

Pastoreo:PCDAIRY 2010 USA [LC]

Calcular el consumo de pradera

Nombre del grupo:

De datos de pasturas

Tipo de pastos:

Calidad de las pasturas:

Masa de pasturas: kg MS/ha

Los datos del rebaño

Número de vacas en el grupo: vacas

Tamaño de Paddock para el grupo de vacas: hectárea

Período de pastoreo de la mañana: horas/día

Período de pastoreo de la mañana: horas/día

Concentrado de consulta: kg MS/vaca/día

Forraje suplementario: kg MS/vaca/día

Datos meteorológicos

La temperatura máxima diaria: °C Humedad a la temperatura diaria máxima: %

Temperatura mínima diaria: °C Humedad a la temperatura diaria min: %

El consumo de pradera: kg MS/vaca/día

Escriba esta ingesta de materia seca como la restricción de límite superior de la pastura en la lista de los piensos.

Figure 4. Grazing dialog box in Spanish language.

Pastejo:PCDAIRY 2010 USA [LC]

Pastejo Calcular consumo de matéria seca

Nome do Grupo: vacas de alta produção

Pastejo de Dados

Tipo de Pastejo: 1. pastejo de capim-base

Pastejo de qualidade: 2. Média qualidade da pastagem

Pastejo Massa: 2000.00 kg de MS/ha

Rebanho de Dados

Número de vacas no grupo: 100 vacas

Paddock tamanho para grupo de vacas: 1.00 hectare

Sessão da manhã Pastejo: 6.00 horas/dia

Sessão da tarde Pastejo: 8.00 horas/dia

Suplementar Concentrado: 2.00 kg MS/vaca/dia

Suplementar de forragem: 3.00 kg MS/vaca/dia

Dados Meteorológicos

Temperatura máxima diária: 25.00 oC umidade na temperatura máxima: 60.00 %

Temperatura mínima diária: 10.00 oC umidade na temperatura mínima: 80.00 %

Calcular o máximo Pastejo Dry Matter Intake

Pastejo Matéria Seca de admissão: 0.00 kg MS/vaca/dia

Digite este ingestão de matéria seca, como a restrição de limite superior para o pasto na sua lista de feeds.

Ajuda Default Fechar

Figure 5. Grazing dialog box in Portuguese language.

Pâturage:PCDAIRY 2010 USA [LC]

Calculer la matière sèche ingérée pâturages

Nom du groupe:

Pâturage de données

Pâturage Type:

Pâturages de qualité:

Pasture Masse: kg de MS/ha

Troupeau de données

Nombre de vaches dans le groupe: vaches

Taille Paddock pour le groupe de vaches: ha

Séance du matin le pâturage: heures/jour

Séance du matin le pâturage: heures/jour

Supplémentaire diluer: kg MS/vache/jour

Complémentaire de fourrage: kg MS/vache/jour

Données météorologiques

Jusqu'à un maximum quotidien oC Humide à la température maximale %

Température quotidienne oC Humide à la température minimale %

Pâturage de matière sèche d'admission: kg MS/vache/jour

Entrez dans ce Dry Matter Intake comme la contrainte limite supérieure pour le pâturage dans votre liste de flux.

Figure 6. Grazing dialog box in French language.