LING 473 – Project 3
Summer 2015

Andrew Troelsen

Totally great.
Interesting write-up; fun to read.
Good persistence in fixing your second, more advanced implementation.
You can check my solution at http://courses.washington.edu/ling473/project-3.html also.

100% +10

Preamble

For this project, we are given an input block of Thai data. As mentioned in the notes, it is common in Thai orthography to not separate word and/or syllable breaks by spaces. The goal here is to use a state machine to parse the input and return the correct word / syllable breaks via the provided sets of vowels, consonant and tone marks.

The input for this program is found at the following location on PATAS:

/opt/dropbox/15-16/473/project3/fsm-input.utf8.txt.

Programming Environment and File Set

Once again, I chose the C# language for this project as implemented under the Mono platform. The code was developed using Xamarin Studio on my Mac OS X computer.

When I began this project, I made use of a simple switch / case construct to model the correct state transitions. After that work was completed, I decided to try and implement a second version of the machine using the Dictionary object states and Func<> objects (with the related lambdas). Because of their common functionally, I also created an interface type to model the core behavior of the machine.

This all being said, I ended up with the following files:

- **Program.cs**: Program Entry Point
- **IThaiSyllabifier.cs**: Interface definition.
- **ThaiSyllabifierCaseLogic.cs**: State machine using switch / case logic.
- **ThaiSyllabifierLambdaLogic.cs**: State machine using lambdas / Func<> objects.
- **StateReturnData.cs**: Currently, my lambda-centric state machine requires the use of a custom class to encapsulate the returned state and text output….this is where I am currently stuck (see below).

Full disclosure! At the time I am authoring this write up- the ThaiSyllabifierLambdaLogic class does not work correctly- I am hoping that I can figure out my error as I go through the write up! But, as far as I can tell, the case logic works fine.

A walkthrough of the key code points can be found over the next several pages.

The Common Interface and Core Main() Logic

Both of my state machine implement the following interface:

```
public interface IThaiSyllabifier
{
    void SyllabifyString(string input);
    string GetOutputString();
}
```

As you can see, the SyllabifyString() method will take a line of Thai input and insert breaks based on the provided state machine notes.

I am returning void from this method. Initially I returned a string- but once I started doing the lambda version of the machine, I realized I needed to return other data (at least it seems that way). Given this, the shared interface also provides a method named GetOutputString() which will returned the syllabified string. I think I would clean this up if I had time- but this is what I am going with for now!

Given that ThaiSyllabifierCaseLogic and ThaiSyllabifierLambdaLogic both implement this interface, I created a simple factory method which will return the correct underlying object based on the presence of –lambda in the command line arguments (this method is in the Program class):

```
static IThaiSyllabifier BreakerFactoryMethod(string[] args)
{
    // See if user wants to use lambda version.
    if (args.Contains ("-lambda"))
        usingLambda = true;

    // Create the buster.
    IThaiSyllabifier breaker = null;
    if (!usingLambda)
        breaker = new ThaiSyllabifierCaseLogic ();
    else
        breaker = new ThaiSyllabifierLambdaLogic ();

    return breaker;
}
```

The Main() method uses the underlying object as so (htmlOutput is a StringBuilder object):

```
// Now loop over each line in the input file and write it out.
foreach (var currLine in File.ReadAllLines(inputFileLocation))
{
  breaker.SyllabifyString (currLine);
  htmlOutput.Append(breaker.GetOutputString());
  htmlOutput.Append("<br/>");
}
```

The last thing to mention at this point is that I did create a secondary interface during my programming time- but it is not currently used. The problem (as you will see) is how each machine handles processing the text characters and how it is returned back.

```
// I made a sub-interface- because the GetOutputString()
// already works for the case logic by returning a string.
// Do I need this?
// Currently not used!!
public interface ILambdaSupport : IThaiSyllabifier
{
   StateReturnData SyllabifyStringLambda(string input);
}
```

(as I well know)

I was wondering about that

The ThaiSyllabifierCaseLogic Implementation

I was *really* surprised how quick (and straightforward) it was to implement the machine using a switch statement (and your notes!). I've read about state machines and did some pencil and paper work before- but this was my first time coding such a construct.

First, my class has member variables for each of the HashSets<> you listed in the assignment notes:

```
public class ThaiSyllabifierCaseLogic : IThaiSyllabifier
{
   #region Vowels, consonants and tones!
   // These HashSet objects contain the possible characters which can correspond to the
   // following input pattern:
   // [V1]C1[C2][V2][T][V3][C3]
   private HashSet<char> vowelSet1 = new HashSet<char>("เแโใไ");
…
   #endregion
…
}
```

Next, I make use of the following C# enum to mark each state (this machine does not use the State.Error value- but the other machine does, so I included it here):

```
// This enum defines the various states the machine can be in.
public enum State {Zero, One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Error};
```

The SyllabifyString() method of the shared interface is implemented using the following algorithm:

- The machine states in State.Zero.
- Take the current input string object and loop over each character.
- Test if the current character is a member of any of the HashSet<> objects using a series of case statements.
- If a match is found, change to the new state (as listed in the assignment notes).
- If we reach an accepting state (State.Seven, State.Eight or State.Nine) we will either add a space before the character in question, or break at that point.

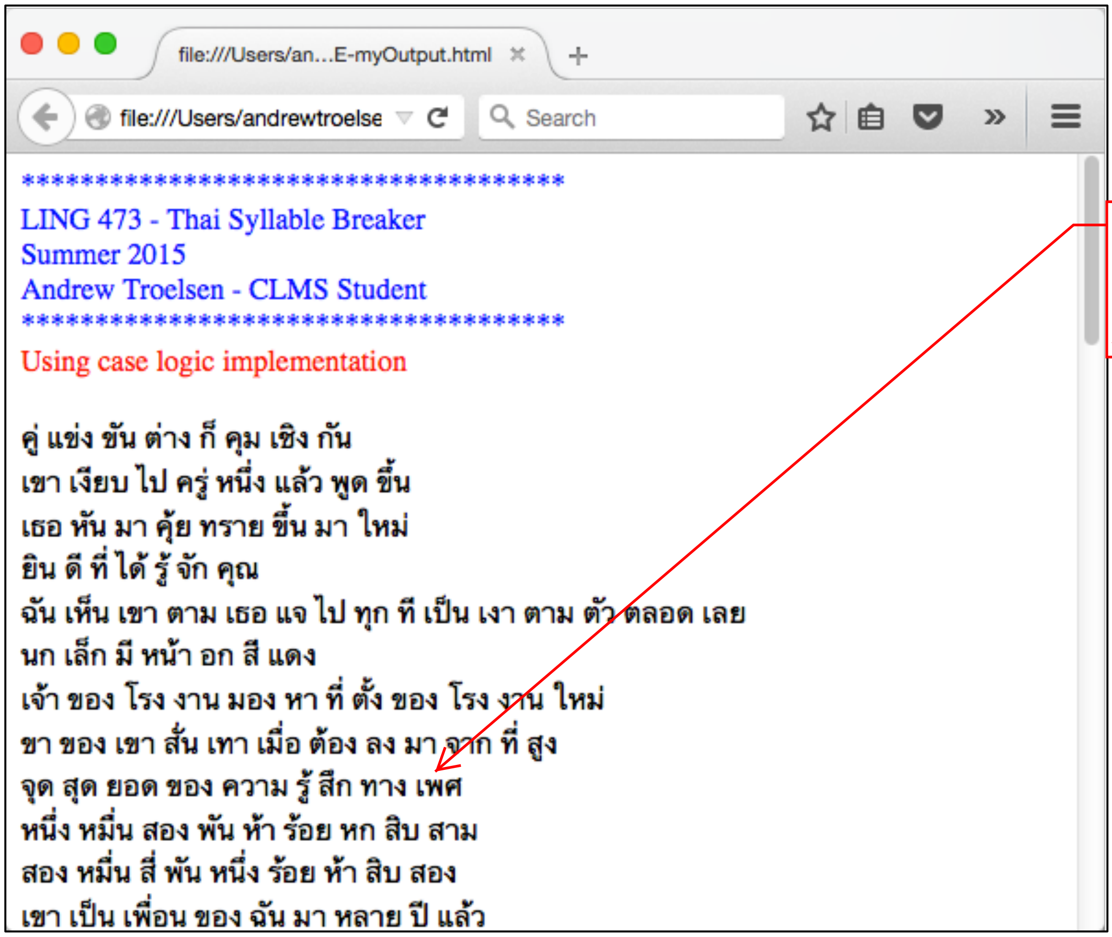
The full implementation of this method is quite long- so I won't repeat everything here. However, the next page showcases the crux of the logic:

```
public void SyllabifyString (string input)
{
    State currentState = State.Zero;

    outputString = new StringBuilder(input);

    // Loop over each character in the input.
    for(int currCharPos = 0; currCharPos < outputString.Length; currCharPos++)
    {
        // Switch on the current state.
        // When in a state, we will check the current character's membership
        // in a given HashSet<> and then transition to next state.
        switch (currentState)
        {
…
    case State.Two:

        if (conSet2.Contains (outputString[currCharPos]))
            currentState = State.Three;
        else if (vowleSet2.Contains (outputString[currCharPos]))
            currentState = State.Four;
        else if (toneSet.Contains (outputString[currCharPos]))
            currentState = State.Five;
        else if (vowelSet3.Contains (outputString[currCharPos]))
            currentState = State.Six;
        else if (conSet3.Contains (outputString[currCharPos]))
            currentState = State.Nine;
        else if (vowelSet1.Contains (outputString[currCharPos]))
            currentState = State.Seven;
        else if (conSet1.Contains (outputString[currCharPos]))
            currentState = State.Eight;
        break;
…
    case State.Seven: // Syllable break!
        currentState = State.One;
        outputString = outputString.Insert (currCharPos - 1, " ");
        break;

    case State.Eight: // Syllable break!
        currentState = State.Two;
        outputString = outputString.Insert (currCharPos - 1, " ");
        break;

    case State.Nine: // Syllable break!
        currentState = State.Zero;
        outputString = outputString.Insert (currCharPos, " ");
        break;
…
}
```

The implementation of the GetOutputString() method is simply to return the "broken" input text:

```
public string GetOutputString()
{
   return outputString.ToString();
}
```

So! If you run the program and do not provide the –lambda command line argument, the program will generate an HTML file named myOutput.html. When I load this up into a web browser, I find the following (partial) output:



```
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Using case logic implementation

คู่ แข่ง ขัน ต่าง ก็ คุม เชิง กัน
เขา เงียบ ไป ครู่ หนึ่ง แล้ว พูด ขึ้น
เธอ หัน มา คุ้ย ทราย ขึ้น มา ใหม่
ยิน ดี ที่ ได้ รู้ จัก คุณ
ฉัน เห็น เขา ตาม เธอ แจ ไป ทุก ที เป็น เงา ตาม ตัว ตลอด เลย
นก เล็ก มี หน้า อก สี แดง
เจ้า ของ โรง งาน มอง หา ที่ ตั้ง ของ โรง งาน ใหม่
ขา ของ เขา สั่น เทา เมื่อ ต้อง ลง มา จาก ที่ สูง
จุด สุด ยอด ของ ความ รู้ สึก ทาง เพศ
หนึ่ง หมื่น สอง พัน ห้า ร้อย หก สิบ สาม
สอง หมื่น สี่ พัน หนึ่ง ร้อย ห้า สิบ สอง
เขา เป็น เพื่อน ของ ฉัน มา หลาย ปี แล้ว
```

nice; this is the correct interpretation of states 7/8/9

By doing an eye-ball comparison of the fsm-output (intended).html file found in the /opt/dropbox/15-16/473/project3 folder, it appear to be the correct output!

The ThaiSyllabifierLambdaLogic Implementation

As mentioned- this is currently not working. I've tried several iterations of this, but I am stuck at the same place each time. I will describe what I have tried so far (you can see all the commented attempts in the C# code file). If I am lucky, maybe I'll have an "AH-HA!" moment while typing.

So, this class still makes use of a custom State enum. No changes there. The class also implements the common interface.

The biggest change is the use of a (massive) Dictionary<> object- I used your slides in lecture 8 as a template. My first iteration of this object mapped each case statement from the other machine using the same technique:

- The Dictionary<> is typed to operate of <State, Func<char,State>> tuples.
- The input to Func<> is the current character to look at. The return value is the new state.

In this partial implementation, you can see where I was trying to go:

```
private Dictionary<State, Func<char, State>> stateMachine = new Dictionary<State, Func<char, State>>
{
    {State.Zero, (ch) => {
                                if (vowelSet1.Contains (outputString[ch]))
                                    return State.One;
                                else if (conSet1.Contains (outputString[ch]))
                                    return State.Two;
                                else return State.Error; } },

    {State.One, (ch) => {
            if (conSet1.Contains (outputString[ch]))
                return State.Two;
            else return State.Error; }},
  …
}
```

I was able to get a clean compile, but I was receiving a null reference exception because the StringBuilder object (outputString) was not initialized. Suddenly I realized this approach would not really work, because this object can't be constructed to hold the current input string until after the Dictionary is created!

<< Thought- I could move this dictionary object as a local variable to the SyllabifyString() method! I will try that after I talk about my other attempts. >>

In my second attempt, I thought maybe a way around this scope problem was to have the Dictionary not simply return the new state, but a new class which holds the state and the current form of the output string (which was a StringBuilder at this point). The class was defined as so:

```
public class StateReturnData
{
   // The lambda version of the machine requires multiple
   // return values- so using this class type.
   public ThaiSyllabifierLambdaLogic.State newState;
   public StringBuilder outputString;

   public StateReturnData(ThaiSyllabifierLambdaLogic.State newState, StringBuilder outputString)
   {
      this.newState = newState;
      this.outputString = outputString;
   }
}
```

With this, the Func<> now looked like so:

```
Func<char, StateReturnData>
```

Some example dictionary entries now looked like so:

```
{State.Zero, (ch) => {
       if (vowelSet1.Contains (outputString[ch]))
          return new StateReturnData(State.One, outputString);
       else if (conSet1.Contains (outputString[ch]))
          return new StateReturnData(State.Two, outputString);
       else return new StateReturnData(State.Error, outputString); } },
...
{ State.Seven, (ch) => {
       outputString = outputString.Insert (ch - 1, " ");
       return new StateReturnData(State.One, outputString);}},

{ State.Eight, (ch) => {
       outputString = outputString.Insert (ch - 1, " ");
       return new StateReturnData(State.Two, outputString);}},

{ State.Nine, (ch) => {
       outputString = outputString.Insert (ch, " ");
       return new StateReturnData(State.Zero, outputString);}}
```

Again, I did get a clean compile....but got a stack overflow exception at runtime :-/ So it seemed that I was copying way too many StringBuilder objects and growing the internal character buffer too far.

So I changed this class to look like so:

```
public class StateReturnData
{
   // The lambda version of the machine requires multiple
   // return values- so using this class type.
   public ThaiSyllabifierLambdaLogic.State newState;
   public StringBuilder outputString = new StringBuilder();

   public StateReturnData(ThaiSyllabifierLambdaLogic.State newState, string outputString)
   {
      this.newState = newState;
      this.outputString.Append(outputString);
   }
}
```

In this case, notice I am attempting to use Append() rather than a straight assignment.

With this change, I went to my third attempt at the massive Dictionary<> object- which is where I am currently stuck.

Now, rather than having a dictionary entry try to consult the outputString object (which again, is currently not holding the input text!! See my realization in yellow above….) I am trying to take the input character and directly consult the HashSet<> objects. For example:

```
{State.Two, (ch) => {
        if (conSet2.Contains (ch))
           return new StateReturnData(State.Three, ch.ToString());
        else if (vowleSet2.Contains (ch))
           return new StateReturnData(State.Four, ch.ToString());
        else if (toneSet.Contains (ch))
           return new StateReturnData(State.Five, ch.ToString());
        else if (vowelSet3.Contains (ch))
           return new StateReturnData(State.Six, ch.ToString());
        else if (conSet3.Contains (ch))
           return new StateReturnData(State.Nine, ch.ToString());
        else if (vowelSet1.Contains (ch))
           return new StateReturnData(State.Seven, ch.ToString());
        else if (conSet1.Contains (ch))
           return new StateReturnData(State.Eight, ch.ToString());
        else return new StateReturnData(State.Error, ch.ToString()); }},
```

Because I was no longer referencing the outputString object, I had to change how I handled states Seven, Eight and Nine by building a temp string object via string.Format. Basically the location of the {0} insertion point is accounting for where to add a space (or not):

```
{State.Seven, (ch) => {
        //outputString = outputString.AppendFormat (" {0}", ch.ToString());
        return new StateReturnData(State.One, string.Format(" {0}", ch.ToString())); }},

{State.Eight, (ch) => {
        //outputString = outputString.AppendFormat (" {0}", ch.ToString());
        return new StateReturnData(State.Two, string.Format(" {0}", ch.ToString())); }},

{State.Nine, (ch) => {
        //outputString = outputString.AppendFormat ("{0} ", ch.ToString());
        return new StateReturnData(State.Zero, string.Format("{0}", ch.ToString())); }},
```

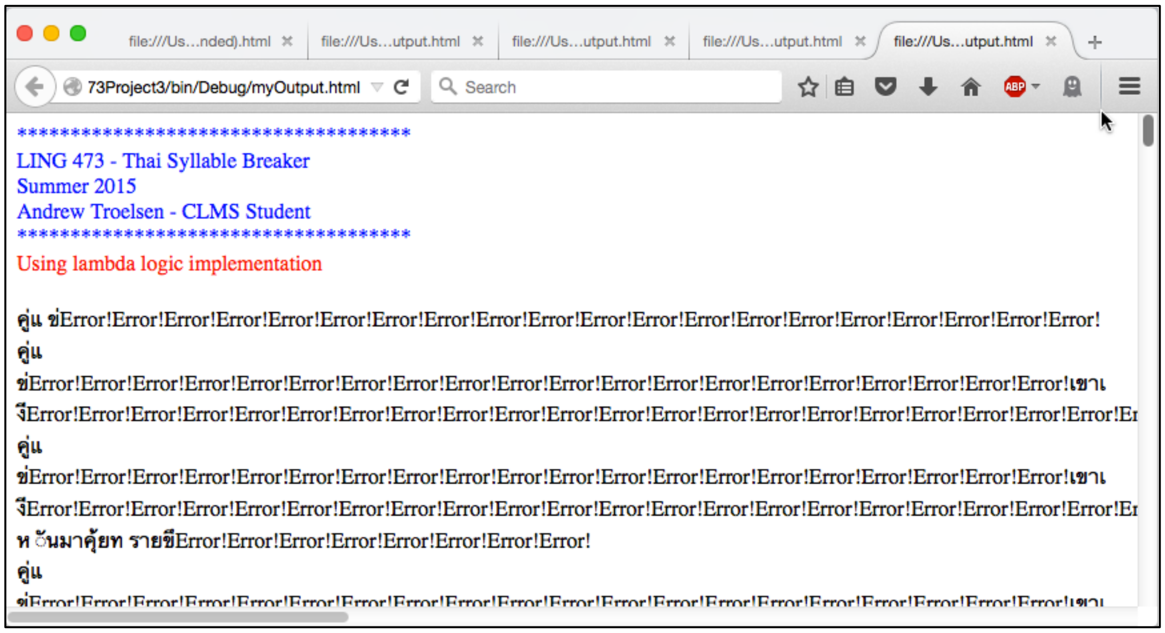
I also added an entry for State.Error like so:

```
{State.Error, (ch) => { return new StateReturnData(State.Error, "Error!");}}
```

Now, here is my current problem!! Most of my Func<> listings have a final “else if” which always transitions to State.Error:

```
{State.Six, (ch) => {
        if (conSet3.Contains (ch))
           return new StateReturnData(State.Nine, ch.ToString());
        else if (vowelSet1.Contains (ch))
           return new StateReturnData(State.Seven, ch.ToString());
        else if (conSet1.Contains (ch))
           return new StateReturnData(State.Eight, ch.ToString());
        else return new StateReturnData(State.Error, ch.ToString()); }},
```

So when I run this iteration- I no longer get a runtime exception (that is nice) but my output is 95% “Error!” tokens:



```
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Using lambda logic implementation

คู่แ ข่Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!Error!
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```
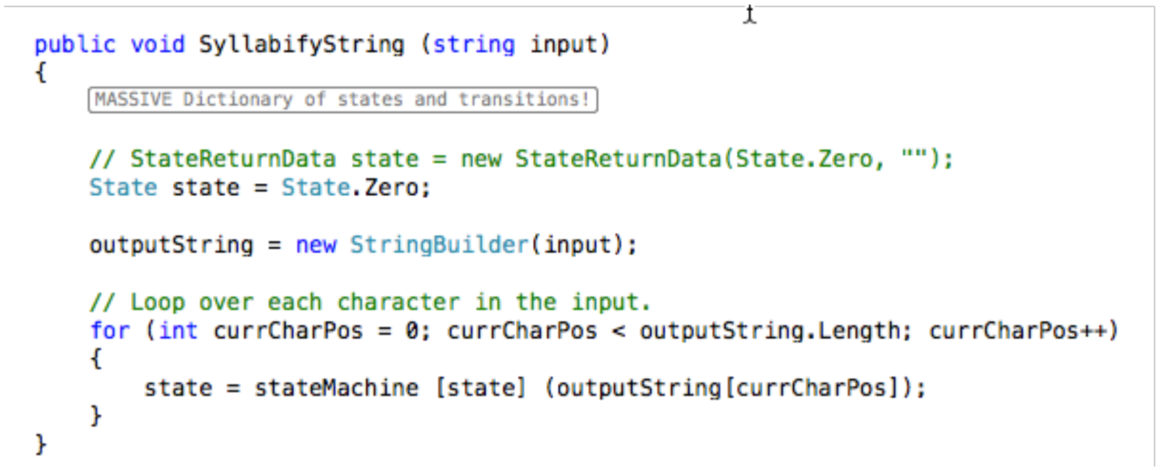

So this is where I was before I started doing my write up.

See next page for possible breakthrough!

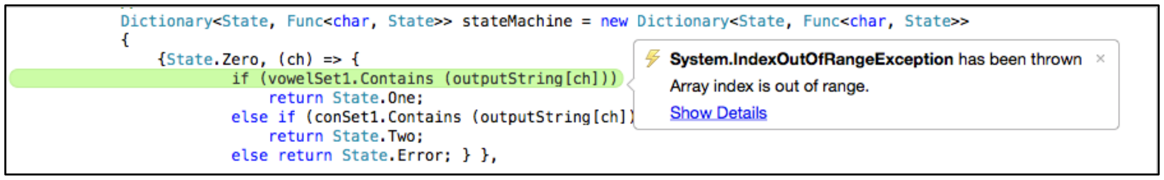
Last Ditch Effort

So during this write up I realized my outputBuffer could never be initialized with the input Thai text, *because* the Dictionary was a class level variable. So I will now try to move the first iteration of the Dictionary into the scope of the SyllabifyString() method (screen shot to prevent huge dump of Dictionary contents):



```
public void SyllabifyString (string input)
{
    MASSIVE Dictionary of states and transitions!

    // StateReturnData state = new StateReturnData(State.Zero, "");
    State state = State.Zero;

    outputString = new StringBuilder(input);

    // Loop over each character in the input.
    for (int currCharPos = 0; currCharPos < outputString.Length; currCharPos++)
    {
        state = stateMachine [state] (outputString[currCharPos]);
    }
}
```

Nope. Now I am getting an index out of range error. Grrrr.



```
Dictionary<State, Func<char, State>> stateMachine = new Dictionary<State, Func<char, State>>
{
    {State.Zero, (ch) => {
            if (vowelSet1.Contains (outputString[ch]))
                return State.One;
            else if (conSet1.Contains (outputString[ch])
                return State.Two;
            else return State.Error; } },
```

System.IndexOutOfRangeException has been thrown

Array index is out of range.

~~Well Glenn, I think I am close here- but I really need to move onto the next program assignment this weekend. So I think I will leave this "as-is" for now. If I have time I really want to come back to this and see if I can figure it out. I think I am close! But I have my in-laws coming to visit next week, so I need to start on Project 4!!~~

~~Thanks!~~

I figured it out! I put the Dictionary object within the scope of the SyllabifyString() method. I also realized I was strangely not noticing that I was trying to index into the StringBuilder using the current CHARACTER not the current CHARACTER COUNT!!! That is why I was getting the index out of range exception above. So I fixed that- and I did not need that extra class for the return value after all.

Just because I am so darn happy now- I'll list out the entire implementation on the next page (or two) ☺

YAY!!!

```
public void SyllabifyString (string input)
{
   // Make this visible to the whole method.
   int currCharPos = 0;

   #region MASSIVE Dictionary of states and transitions!
   // This dictionary holds a list of Func<> objects, which take the current character as input, and return the
   // new state.
   Dictionary<State, Func<char, State>> stateMachine = new Dictionary<State, Func<char, State>>
   {
      {State.Zero, (ch) => {
            if (vowelSet1.Contains (ch))
               return State.One;
            else if (conSet1.Contains (ch))
               return State.Two;
            else return State.Error; } },

      {State.One, (ch) => {
            if (conSet1.Contains (ch))
               return State.Two;
            else return State.Error; }},

      {State.Two, (ch) => {
            if (conSet2.Contains (ch))
               return State.Three;
            else if (vowleSet2.Contains (ch))
               return State.Four;
            else if (toneSet.Contains (ch))
               return State.Five;
            else if (vowelSet3.Contains (ch))
               return State.Six;
            else if (conSet3.Contains (ch))
               return State.Nine;
            else if (vowelSet1.Contains (ch))
               return State.Seven;
            else if (conSet1.Contains (ch))
               return State.Eight;
            else return State.Error; }},

      {State.Three, (ch) => {
            if (vowleSet2.Contains (ch))
               return State.Four;
            else if (toneSet.Contains (ch))
               return State.Five;
            else if (vowelSet3.Contains (ch))
               return State.Six;
            else if (conSet3.Contains (ch))
               return State.Nine;
            else return State.Error; }},


      {State.Four, (ch) => {
            if (toneSet.Contains (ch))
               return State.Five;
            else if (vowelSet3.Contains (ch))
               return State.Six;
            else if (conSet3.Contains (ch))
               return State.Nine;
            else if (vowelSet1.Contains (ch))
               return State.Seven;
            else if (conSet1.Contains (ch))
               return State.Eight;
            else return State.Error; }},

        {State.Five, (ch) => {
            if (vowelSet3.Contains (ch))
               return State.Six;
            else if (conSet3.Contains (ch))
               return State.Nine;
            else if (vowelSet1.Contains (ch))
               return State.Seven;
            else if (conSet1.Contains (ch))
               return State.Eight;
            else return State.Error; }},

        {State.Six, (ch) => {
            if (conSet3.Contains (ch))
               return State.Nine;
            else if (vowelSet1.Contains (ch))
               return State.Seven;
            else if (conSet1.Contains (ch))
               return State.Eight;
            else return State.Error; }},


        {State.Seven, (ch) => {
            outputString = outputString.Insert (currCharPos - 1, " ");
            return State.One;}},

        {State.Eight, (ch) => {
            outputString = outputString.Insert (currCharPos - 1, " ");
            return State.Two;}},

        {State.Nine, (ch) => {
            outputString = outputString.Insert (currCharPos, " ");
            return State.Zero;}}
    };
    #endregion

    // StateReturnData state = new StateReturnData(State.Zero, "");
    State state = State.Zero;

    outputString = new StringBuilder(input);

    // Loop over each character in the input.
    for (currCharPos = 0; currCharPos < outputString.Length; currCharPos++)
    {
       state = stateMachine [state] (outputString[currCharPos]);
    }
}
```

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;

namespace Ling473Project3
{
    public class ThaiSyllabifierLambdaLogic : IThaiSyllabifier
    {
        #region Vowels, consonants and tones!
        // These HashSet objects contain the possible characters which can correspond to the
        // following input pattern:
        // [V1]C1[C2][V2][T][V3][C3]
        private static HashSet<char> vowelSet1 = new HashSet<char>("แโไใ");
        private static HashSet<char> conSet1 = new HashSet<char>("กขฃคฅฆงจฉชซฌญฎฏฐฑฒณดตถทธนบปผฝพฟภมยรฤลฦวศษสหฬอฮ"
        private static HashSet<char> conSet2 = new HashSet<char>("รลวนม");

        private static HashSet<char> vowleSet2 = new HashSet<char>("◌◌ิ ◌ี ◌ึ ◌ื ◌ุ ◌ู ◌ั ◌็");
        private static HashSet<char> toneSet = new HashSet<char> { '\u0E48', '\u0E49', '\u0E4A', '\u0E4B' };
        private static HashSet<char> vowelSet3 = new HashSet<char>("าอยว");
        private static HashSet<char> conSet3 = new HashSet<char>("งนมดบกยว");
        #endregion

        // This enum defines the various states the machine can be in.
        public enum State {Zero, One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Error};

        private static StringBuilder outputString = new StringBuilder();

        #region Take One
        /* Take one...
        #region MASSIVE Dictionary of states and transitions!
        // This dictionary holds a list of Func<> objects, which take the current character as input, and return the
        // new state.
        private Dictionary<State, Func<char, State>> stateMachine = new Dictionary<State, Func<char, State>>
        {
            {State.Zero, (ch) => {
                                    if (vowelSet1.Contains (outputString[ch]))
                                        return State.One;
                                    else if (conSet1.Contains (outputString[ch]))
                                        return State.Two;
                                    else return State.Error; } },

            {State.One, (ch) => {
                    if (conSet1.Contains (outputString[ch]))
                        return State.Two;
                    else return State.Error; }},

            {State.Two, (ch) => {
                    if (conSet2.Contains (outputString[ch]))
                        return State.Three;
                    else if (vowleSet2.Contains (outputString[ch]))
                        return State.Four;
                    else if (toneSet.Contains (outputString[ch]))
                        return State.Five;
                    else if (vowelSet3.Contains (outputString[ch]))
                        return State.Six;
                    else if (conSet3.Contains (outputString[ch]))
                        return State.Nine;
                    else if (vowelSet1.Contains (outputString[ch]))
                        return State.Seven;
                    else if (conSet1.Contains (outputString[ch]))
                        return State.Eight;
                    else return State.Error; }},

            {State.Three, (ch) => {
                    if (vowleSet2.Contains (outputString[ch]))
                        return State.Four;
                    else if (toneSet.Contains (outputString[ch]))
                        return State.Five;
                    else if (vowelSet3.Contains (outputString[ch]))
                        return State.Six;
                    else if (conSet3.Contains (outputString[ch]))
                    return State.Nine;
                else return State.Error; }},


        {State.Four, (ch) => {
                if (toneSet.Contains (outputString[ch]))
                    return State.Five;
                else if (vowelSet3.Contains (outputString[ch]))
                    return State.Six;
                else if (conSet3.Contains (outputString[ch]))
                    return State.Nine;
                else if (vowelSet1.Contains (outputString[ch]))
                    return State.Seven;
                else if (conSet1.Contains (outputString[ch]))
                    return State.Eight;
                else return State.Error; }},

        {State.Five, (ch) => {
                if (vowelSet3.Contains (outputString[ch]))
                    return State.Six;
                else if (conSet3.Contains (outputString[ch]))
                    return State.Nine;
                else if (vowelSet1.Contains (outputString[ch]))
                    return State.Seven;
                else if (conSet1.Contains (outputString[ch]))
                    return State.Eight;
                else return State.Error; }},

        {State.Six, (ch) => {
                if (conSet3.Contains (outputString[ch]))
                    return State.Nine;
                else if (vowelSet1.Contains (outputString[ch]))
                    return State.Seven;
                else if (conSet1.Contains (outputString[ch]))
                    return State.Eight;
                else return State.Error; }},


        {State.Seven, (ch) => {
                outputString = outputString.Insert (ch - 1, " ");
                return State.One;}},

        {State.Eight, (ch) => {
                outputString = outputString.Insert (ch - 1, " ");
                return State.Two;}},

        {State.Nine, (ch) => {
                outputString = outputString.Insert (ch, " ");
                return State.Zero;}}
    };
    #endregion
    */
    #endregion

    #region Take Two
    /* Take two....
    // This dictionary holds a list of Func<> objects, which take the current character as input, and return the
    // new state.
    private Dictionary<State, Func<char, StateReturnData>> stateMachine = new Dictionary<State, Func<char, StateR
    {
        {State.Zero, (ch) => {
                if (vowelSet1.Contains (outputString[ch]))
                    return new StateReturnData(State.One, outputString);
                else if (conSet1.Contains (outputString[ch]))
                    return new StateReturnData(State.Two, outputString);
                else return new StateReturnData(State.Error, outputString); } },

        {State.One, (ch) => {
                if (conSet1.Contains (outputString[ch]))
                    return new StateReturnData(State.Two, outputString);
                else return new StateReturnData(State.Error, outputString); }},
{State.Two, (ch) => {
        if (conSet2.Contains (outputString[ch]))
            return new StateReturnData(State.Three, outputString);
        else if (vowleSet2.Contains (outputString[ch]))
            return new StateReturnData(State.Four, outputString);
        else if (toneSet.Contains (outputString[ch]))
            return new StateReturnData(State.Five, outputString);
        else if (vowelSet3.Contains (outputString[ch]))
            return new StateReturnData(State.Six, outputString);
        else if (conSet3.Contains (outputString[ch]))
            return new StateReturnData(State.Nine, outputString);
        else if (vowelSet1.Contains (outputString[ch]))
            return new StateReturnData(State.Seven, outputString);
        else if (conSet1.Contains (outputString[ch]))
            return new StateReturnData(State.Eight, outputString);
        else return new StateReturnData(State.Error, outputString); }},

{State.Three, (ch) => {
        if (vowleSet2.Contains (outputString[ch]))
            return new StateReturnData(State.Four, outputString);
        else if (toneSet.Contains (outputString[ch]))
            return new StateReturnData(State.Five, outputString);
        else if (vowelSet3.Contains (outputString[ch]))
            return new StateReturnData(State.Six, outputString);
        else if (conSet3.Contains (outputString[ch]))
            return new StateReturnData(State.Nine, outputString);
        else return new StateReturnData(State.Error, outputString); }},


{State.Four, (ch) => {
        if (toneSet.Contains (outputString[ch]))
            return new StateReturnData(State.Five, outputString);
        else if (vowelSet3.Contains (outputString[ch]))
            return new StateReturnData(State.Six, outputString);
        else if (conSet3.Contains (outputString[ch]))
            return new StateReturnData(State.Nine, outputString);
        else if (vowelSet1.Contains (outputString[ch]))
            return new StateReturnData(State.Seven, outputString);
        else if (conSet1.Contains (outputString[ch]))
            return new StateReturnData(State.Eight, outputString);
        else return new StateReturnData(State.Error, outputString); }},

{State.Five, (ch) => {
        if (vowelSet3.Contains (outputString[ch]))
            return new StateReturnData(State.Six, outputString);
        else if (conSet3.Contains (outputString[ch]))
            return new StateReturnData(State.Nine, outputString);
        else if (vowelSet1.Contains (outputString[ch]))
            return new StateReturnData(State.Seven, outputString);
        else if (conSet1.Contains (outputString[ch]))
            return new StateReturnData(State.Eight, outputString);
        else return new StateReturnData(State.Error, outputString); }},

{State.Six, (ch) => {
        if (conSet3.Contains (outputString[ch]))
            return new StateReturnData(State.Nine, outputString);
        else if (vowelSet1.Contains (outputString[ch]))
            return new StateReturnData(State.Seven, outputString);
        else if (conSet1.Contains (outputString[ch]))
            return new StateReturnData(State.Eight, outputString);
        else return new StateReturnData(State.Error, outputString); }},


{State.Seven, (ch) => {
        outputString = outputString.Insert (ch - 1, " ");
        return new StateReturnData(State.One, outputString);}},

{State.Eight, (ch) => {
        outputString = outputString.Insert (ch - 1, " ");
        return new StateReturnData(State.Two, outputString);}},

{State.Nine, (ch) => {
```

```
            outputString = outputString.Insert (ch, " ");
            return new StateReturnData(State.Zero, outputString);}}
};
*/
#endregion

#region Take Three
/*
// This dictionary holds a list of Func<> objects, which take the current character as input, and return the
// new state.
private Dictionary<State, Func<char, StateReturnData>> stateMachine = new Dictionary<State, Func<char, StateR
{
    {State.Zero, (ch) => {
            if (vowelSet1.Contains (ch))
                return new StateReturnData(State.One, ch.ToString());
            else if (conSet1.Contains (ch))
                return new StateReturnData(State.Two, ch.ToString());
            else return new StateReturnData(State.Error, ch.ToString()); } },

    {State.One, (ch) => {
            if (conSet1.Contains (ch))
                return new StateReturnData(State.Two, ch.ToString());
            else return new StateReturnData(State.Error, ch.ToString()); }},

    {State.Two, (ch) => {
            if (conSet2.Contains (ch))
                return new StateReturnData(State.Three, ch.ToString());
            else if (vowleSet2.Contains (ch))
                return new StateReturnData(State.Four, ch.ToString());
            else if (toneSet.Contains (ch))
                return new StateReturnData(State.Five, ch.ToString());
            else if (vowelSet3.Contains (ch))
                return new StateReturnData(State.Six, ch.ToString());
            else if (conSet3.Contains (ch))
                return new StateReturnData(State.Nine, ch.ToString());
            else if (vowelSet1.Contains (ch))
                return new StateReturnData(State.Seven, ch.ToString());
            else if (conSet1.Contains (ch))
                return new StateReturnData(State.Eight, ch.ToString());
            else return new StateReturnData(State.Error, ch.ToString()); }},

    {State.Three, (ch) => {
            if (vowleSet2.Contains (ch))
                return new StateReturnData(State.Four, ch.ToString());
            else if (toneSet.Contains (ch))
                return new StateReturnData(State.Five, ch.ToString());
            else if (vowelSet3.Contains (ch))
                return new StateReturnData(State.Six, ch.ToString());
            else if (conSet3.Contains (ch))
                return new StateReturnData(State.Nine, ch.ToString());
            else return new StateReturnData(State.Error, ch.ToString()); }},


    {State.Four, (ch) => {
            if (toneSet.Contains (ch))
                return new StateReturnData(State.Five, ch.ToString());
            else if (vowelSet3.Contains (ch))
                return new StateReturnData(State.Six, ch.ToString());
            else if (conSet3.Contains (ch))
                return new StateReturnData(State.Nine, ch.ToString());
            else if (vowelSet1.Contains (ch))
                return new StateReturnData(State.Seven, ch.ToString());
            else if (conSet1.Contains (ch))
                return new StateReturnData(State.Eight, ch.ToString());
            else return new StateReturnData(State.Error, ch.ToString()); }},

    {State.Five, (ch) => {
            if (vowelSet3.Contains (ch))
                return new StateReturnData(State.Six, ch.ToString());
            else if (conSet3.Contains (ch))
                return new StateReturnData(State.Nine, ch.ToString());
            else if (vowelSet1.Contains (ch))
```

```
                    return new StateReturnData(State.Seven, ch.ToString());
                else if (conSet1.Contains (ch))
                    return new StateReturnData(State.Eight, ch.ToString());
                else return new StateReturnData(State.Error, ch.ToString()); }},

        {State.Six, (ch) => {
                if (conSet3.Contains (ch))
                    return new StateReturnData(State.Nine, ch.ToString());
                else if (vowelSet1.Contains (ch))
                    return new StateReturnData(State.Seven, ch.ToString());
                else if (conSet1.Contains (ch))
                    return new StateReturnData(State.Eight, ch.ToString());
                else return new StateReturnData(State.Error, ch.ToString()); }},


        {State.Seven, (ch) => {
                //outputString = outputString.AppendFormat (" {0}", ch.ToString());
                return new StateReturnData(State.One, string.Format(" {0}", ch.ToString())); }},

        {State.Eight, (ch) => {
                //outputString = outputString.AppendFormat (" {0}", ch.ToString());
                return new StateReturnData(State.Two, string.Format(" {0}", ch.ToString())); }},

        {State.Nine, (ch) => {
                //outputString = outputString.AppendFormat ("{0} ", ch.ToString());
                return new StateReturnData(State.Zero, string.Format("{0}", ch.ToString())); }},

        {State.Error, (ch) => { return new StateReturnData(State.Error, "Error!");}}
    };
    */
    #endregion

    #region IThaiSyllabifier Implementation

    /*
    public void SyllabifyString (string input)
    {
        StateReturnData state = new StateReturnData(State.Zero, "");
        int currChar = 0;

        while (currChar < input.Length)
        {
            state = this.stateMachine [state.newState] (input [currChar++]);
            outputString.Append (state.outputString);
        }
    }
*/

    public void SyllabifyString (string input)
    {
        // Make this visible to the whole method.
        int currCharPos = 0;

        #region MASSIVE Dictionary of states and transitions!
        // This dictionary holds a list of Func<> objects, which take the current character as input, and return
        // new state.
        Dictionary<State, Func<char, State>> stateMachine = new Dictionary<State, Func<char, State>>
        {
            {State.Zero, (ch) => {
                    if (vowelSet1.Contains (ch))
                        return State.One;
                    else if (conSet1.Contains (ch))
                        return State.Two;
                    else return State.Error; } },

            {State.One, (ch) => {
                    if (conSet1.Contains (ch))
                        return State.Two;
                    else return State.Error; }},

            {State.Two, (ch) => {
                    if (conSet2.Contains (ch))
                        return State.Three;
                    else if (vowleSet2.Contains (ch))
                        return State.Four;
                    else if (toneSet.Contains (ch))
                        return State.Five;
                    else if (vowelSet3.Contains (ch))
                        return State.Six;
                    else if (conSet3.Contains (ch))
                        return State.Nine;
                    else if (vowelSet1.Contains (ch))
                        return State.Seven;
                    else if (conSet1.Contains (ch))
                        return State.Eight;
                    else return State.Error; }},

            {State.Three, (ch) => {
                    if (vowleSet2.Contains (ch))
                        return State.Four;
                    else if (toneSet.Contains (ch))
                        return State.Five;
                    else if (vowelSet3.Contains (ch))
                        return State.Six;
                    else if (conSet3.Contains (ch))
                        return State.Nine;
                    else return State.Error; }},


            {State.Four, (ch) => {
                    if (toneSet.Contains (ch))
                        return State.Five;
                    else if (vowelSet3.Contains (ch))
                        return State.Six;
                    else if (conSet3.Contains (ch))
                        return State.Nine;
                    else if (vowelSet1.Contains (ch))
                        return State.Seven;
                    else if (conSet1.Contains (ch))
                        return State.Eight;
                    else return State.Error; }},

            {State.Five, (ch) => {
                    if (vowelSet3.Contains (ch))
                        return State.Six;
                    else if (conSet3.Contains (ch))
                        return State.Nine;
                    else if (vowelSet1.Contains (ch))
                        return State.Seven;
                    else if (conSet1.Contains (ch))
                        return State.Eight;
                    else return State.Error; }},

            {State.Six, (ch) => {
                    if (conSet3.Contains (ch))
                        return State.Nine;
                    else if (vowelSet1.Contains (ch))
                        return State.Seven;
                    else if (conSet1.Contains (ch))
                        return State.Eight;
                    else return State.Error; }},


            {State.Seven, (ch) => {
                    outputString = outputString.Insert (currCharPos - 1, " ");
                    return State.One;}},

            {State.Eight, (ch) => {
                    outputString = outputString.Insert (currCharPos - 1, " ");
                    return State.Two;}},

            {State.Nine, (ch) => {
                    outputString = outputString.Insert (currCharPos, " ");
                    return State.Zero;}}
                    };
                    #endregion

                    // StateReturnData state = new StateReturnData(State.Zero, "");
                    State state = State.Zero;

                    outputString = new StringBuilder(input);

                    // Loop over each character in the input.
                    for (currCharPos = 0; currCharPos < outputString.Length; currCharPos++)
                    {
                        state = stateMachine [state] (outputString[currCharPos]);
                    }
                }

                public string GetOutputString()
                {
                    return outputString.ToString();
                }
                #endregion
            }
}
```

```
using System;

// Need this for HashSet<> object.
using System.Collections.Generic;
using System.Text;

namespace Ling473Project3
{
    public class ThaiSyllabifierCaseLogic : IThaiSyllabifier
    {
        #region Vowels, consonants and tones!
        // These HashSet objects contain the possible characters which can correspond to the
        // following input pattern:
        // [V1]C1[C2][V2][T][V3][C3]
        private HashSet<char> vowelSet1 = new HashSet<char>("แเโไ");
        private HashSet<char> conSet1 = new HashSet<char>("กขฃคฅฆงจฉชซฌญฎฏฐฑฒณดตถทธนบปผฝพฟภมยรฤลฦวศษสหฬอฮ");
        private HashSet<char> conSet2 = new HashSet<char>("รลวนม");
        private HashSet<char> vowleSet2 = new HashSet<char>("◌◌ิ ◌ี ◌ึ ◌ื ◌ุ ◌ู ◌ั ็");
        private HashSet<char> toneSet = new HashSet<char> { '\u0E48', '\u0E49', '\u0E4A', '\u0E4B' };
        private HashSet<char> vowelSet3 = new HashSet<char>("าอยว");
        private HashSet<char> conSet3 = new HashSet<char>("งนมดบกยว");
        #endregion

        // This enum defines the various states the machine can be in.
        public enum State {Zero, One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Error};

        private StringBuilder outputString = null;

        #region IThaiSyllabifier implementation
        public void SyllabifyString (string input)
        {
            State currentState = State.Zero;

            outputString = new StringBuilder(input);

            // Loop over each character in the input.
            for(int currCharPos = 0; currCharPos < outputString.Length; currCharPos++)
            {
                // Switch on the current state.
                // When in a state, we will check the current character's membership
                // in a given HashSet<> and then transition to next state.
                switch (currentState)
                {

                #region Starting State
                case State.Zero: // Start state can contain either V1 or C1.
                    if (vowelSet1.Contains (outputString[currCharPos]))
                        currentState = State.One;
                    else if (conSet1.Contains (outputString[currCharPos]))
                        currentState = State.Two;
                    break;
                #endregion

                #region Intermentent states
                case State.One:
                    if (conSet1.Contains (outputString[currCharPos]))
                        currentState = State.Two;
                    break;

                case State.Two:

                    if (conSet2.Contains (outputString[currCharPos]))
                        currentState = State.Three;
                    else if (vowleSet2.Contains (outputString[currCharPos]))
                        currentState = State.Four;
                    else if (toneSet.Contains (outputString[currCharPos]))
                        currentState = State.Five;
                    else if (vowelSet3.Contains (outputString[currCharPos]))
                        currentState = State.Six;
                    else if (conSet3.Contains (outputString[currCharPos]))
                        currentState = State.Nine;
                    else if (vowelSet1.Contains (outputString[currCharPos]))
                currentState = State.Seven;
            else if (conSet1.Contains (outputString[currCharPos]))
                currentState = State.Eight;
            break;

        case State.Three:
            if (vowleSet2.Contains (outputString[currCharPos]))
                currentState = State.Four;
            else if (toneSet.Contains (outputString[currCharPos]))
                currentState = State.Five;
            else if (vowelSet3.Contains (outputString[currCharPos]))
                currentState = State.Six;
            else if (conSet3.Contains (outputString[currCharPos]))
                currentState = State.Nine;
            break;

        case State.Four:
            if (toneSet.Contains (outputString[currCharPos]))
                currentState = State.Five;
            else if (vowelSet3.Contains (outputString[currCharPos]))
                currentState = State.Six;
            else if (conSet3.Contains (outputString[currCharPos]))
                currentState = State.Nine;
            else if (vowelSet1.Contains (outputString[currCharPos]))
                currentState = State.Seven;
            else if (conSet1.Contains (outputString[currCharPos]))
                currentState = State.Eight;
            break;

        case State.Five:
            if (vowelSet3.Contains (outputString[currCharPos]))
                currentState = State.Six;
            else if (conSet3.Contains (outputString[currCharPos]))
                currentState = State.Nine;
            else if (vowelSet1.Contains (outputString[currCharPos]))
                currentState = State.Seven;
            else if (conSet1.Contains (outputString[currCharPos]))
                currentState = State.Eight;
            break;

        case State.Six:
            if (conSet3.Contains (outputString[currCharPos]))
                currentState = State.Nine;
            else if (vowelSet1.Contains (outputString[currCharPos]))
                currentState = State.Seven;
            else if (conSet1.Contains (outputString[currCharPos]))
                currentState = State.Eight;
            break;
        #endregion

        #region Final / Accepting States
        case State.Seven: // Syllable break!
            currentState = State.One;
            outputString = outputString.Insert (currCharPos - 1, " ");
            break;

        case State.Eight: // Syllable break!
            currentState = State.Two;
            outputString = outputString.Insert (currCharPos - 1, " ");
            break;

        case State.Nine: // Syllable break!
            currentState = State.Zero;
            outputString = outputString.Insert (currCharPos, " ");
            break;
        #endregion

        }
    }
}

public string GetOutputString()
```

```
        {
            return outputString.ToString();
        }
        #endregion
    }
}
```

```
using System;

namespace Ling473Project3
{
    public interface IThaiSyllabifier
    {
        void SyllabifyString(string input);
        string GetOutputString();
    }

    // I made a sub-interface- because the GetOutputString()
    // already works for the case logic by returning a string.
    // Do I need this?
    // Currently not used!!
    public interface ILambdaSupport : IThaiSyllabifier
    {
        StateReturnData SyllabifyStringLambda(string input);
    }
}
```

```
using System;
using System.Text;

namespace Ling473Project3
{
    /* First attempt...
    public class StateReturnData
    {
        // The lambda version of the machine requires multiple
        // return values- so using this class type.
        public ThaiSyllabifierLambdaLogic.State newState;
        public StringBuilder outputString;

        public StateReturnData(ThaiSyllabifierLambdaLogic.State newState, StringBuilder outputString)
        {
            this.newState = newState;
            this.outputString = outputString;
        }
    }
    */

    public class StateReturnData
    {
        // The lambda version of the machine requires multiple
        // return values- so using this class type.
        public ThaiSyllabifierLambdaLogic.State newState;
        public StringBuilder outputString = new StringBuilder();

        public StateReturnData(ThaiSyllabifierLambdaLogic.State newState, string outputString)
        {
            this.newState = newState;
            this.outputString.Append(outputString);
        }
    }
}
```

```
using System;
using System.IO;
using System.Text;
using System.Linq; // For contains extension method.

namespace Ling473Project3
{
    class MainClass
    {
        // This one is for PATAS
        // static string inputFileLocation = "/opt/dropbox/15-16/473/project3/fsm-input.utf8.txt";

        // This one for local (in bin/debug).
        static string inputFileLocation = "fsm-input.utf8.txt";

        static bool usingLambda = false;

        public static void Main (string[] args)
        {
            IThaiSyllabifier breaker = null;
            breaker = BreakerFactoryMethod (args);

            // This will hold the output HTML text.
            StringBuilder htmlOutput = new StringBuilder ();

            // Say hello.
            EmitHelloMessage(htmlOutput);

            // Emit the opening <html>, <meta/> and opening <body> tags.
            htmlOutput.Append("<html><meta http-equiv='Content-Type' content='text/html; charset=UTF-8' /><body>");

            // Now loop over each line in the input file and write it out.
            foreach (var currLine in File.ReadAllLines(inputFileLocation))
            {
                breaker.SyllabifyString (currLine);
                htmlOutput.Append(breaker.GetOutputString());
                htmlOutput.Append("<br/>");
            }

            // Emit the closing message / tags.
            EmitClosingMessage(htmlOutput);
            htmlOutput.Append("</body></html>");

            // Dump to file.
            File.WriteAllText ("myOutput.html", htmlOutput.ToString ());
            Console.WriteLine ("Please load myOutput.html into a web browser to see program results.");
        }

        #region Open / Close Message
        static void EmitHelloMessage(StringBuilder sb)
        {
            sb.Append ("<font color = \"blue\">");
            sb.Append ("*************************************<br/>");
            sb.Append ("LING 473 - Thai Syllable Breaker<br/>");
            sb.Append ("Summer 2015<br/>");
            sb.Append ("Andrew Troelsen - CLMS Student<br/>");
            sb.Append ("*************************************<br/>");
            sb.Append ("</font>");

            sb.Append ("<font color = \"red\">");
            if (!usingLambda)
                sb.Append ("Using case logic implementation<br/><br/>");
            else
                sb.Append ("Using lambda logic implementation<br/><br/>");

            sb.Append ("</font>");
        }

        static void EmitClosingMessage(StringBuilder sb)
        {
            sb.Append ("<font color = \"blue\">");
            sb.Append ("<br/>*************************************<br/>");
            sb.Append ("All Done!  Thanks for playing.<br/>");
            sb.Append ("************************************<br/>");
            sb.Append ("</font>");
        }
        #endregion

        #region Simple factory
        static IThaiSyllabifier BreakerFactoryMethod(string[] args)
        {
            // See if user wants to use lambda version.
            if (args.Contains ("-lambda"))
                usingLambda = true;

            // Create the buster.
            IThaiSyllabifier breaker = null;
            if (!usingLambda)
                breaker = new ThaiSyllabifierCaseLogic ();
            else
                breaker = new ThaiSyllabifierLambdaLogic ();

            return breaker;
        }
        #endregion
    }
}
```

คู่ แข่ง ขัน ต่าง ก็ คุม เชิง กัน
เขา เงียบ ไป ครู่ หนึ่ง แล้ว พูด ขึ้น
เธอ หัน มา คุ้ย ทราย ขึ้น มา ใหม่
ยิน ดี ที่ ได้ รู้ จัก คุณ
ฉัน เห็น เขา ตาม เธอ แจ ไป ทุก ที เป็น เงา ตาม ตัว ตลอด เลย
นก เล็ก มี หน้า อก สี แดง
เจ้า ของ โรง งาน มอง หา ที่ ตั้ง ของ โรง งาน ใหม่
ขา ของ เขา สั่น เทา เมื่อ ต้อง ลง มา จาก ที่ สูง
จุด สุด ยอด ของ ความ รู้ สึก ทาง เพศ
หนึ่ง หมื่น สอง พัน ห้า ร้อย หก สิบ สาม
สอง หมื่น สี่ พัน หนึ่ง ร้อย ห้า สิบ สอง
เขา เป็น เพื่อน ของ ฉัน มา หลาย ปี แล้ว
บ้าน หลัง นั้น ไม่ ใช่ ของ เขา เล็ก ไป
เขา ผลัด ค่า เช่า ห้อง มา เดือน หนึ่ง แล้ว
ฉัน ตาย ด้าน ใน เรื่อง ความ รัก เสีย แล้ว หลัง จาก ที่ ฉัน เคย ผิด หวัง กับ ความ รัก
แบ่ง ขนม ปัง ก้อน หนึ่ง ออก เป็น สอง ชิ้น
ใน หัว ใจ ของ ฉัน มี เพียง คุณ
วัน ที่ สี่ เดือน หน้า เป็น วัน พุธ
เมื่อ คืน นี้ ฉัน กลับ บ้าน ดึก มาก
แต่ เรา ต้อง กลับ มา เปลี่ยน ชุด ก่อน
เธอ รู้ สึก ใจ ชื้น ขึ้น เป็น กอง
หมื่น สอง พัน สาม ร้อย สี่ สิบ ห้า
เขา เอา ช้าง บ้าน ไป ต่อ ช้าง ป่า
ฉัน เอง ไม่ ได้ พูด ดัง นั้น ดอก
ขอ ให้ เดิน ทาง ด้วย ความ ปลอด ภัย
ดี ใจ ที่ ได้ รู้ จัก คุณ
ค่อย ชุบ ให้ เกิด ความ กล้า แข็ง
หนัง เรื่อง นั้น ค่อน ข้าง น่า เบื่อ
เขา ไป ส่ง จด หมาย ให้ ผม
เขียน ด้วย มือ แล้ว ลบ ด้วย เท้า
รัก ฉัน ต้อง รัก หมา ฉัน ด้วย
ราย งาน ข่าว กับ ที่ ได้ เห็น จริง ให้ ความ รู้ สึก ต่าง กัน มาก
ถึง ตอน นี้ เรา ต้อง ยัก ย้าย ถ่าย เท เพื่อ เอา ตัว รอด แล้ว
ใบ ตอบ รับ ของ ผู้ ส่ง
รอง เท้า หนัง สวม เดิน เล่น
เครื่อง หมาย ทาง ข้าม โรง เรียน
แป้น หมุน เครื่อง ปั้น ดิน เผา
ขี้ ผึ้ง ทา ริม ฝี ปาก
เมื่อ สอง คืน ที่ ผ่าน มา

ไม่ ถูก บัง คับ ฝืน รั้ง

แสง สี ขาว ของ กลุ่ม เมฆ

ไม่ เก่า ครับ เพิ่ง สร้าง มา ได้ แค่ ห้า ปี เอง

ฉัน เพิ่ง กลับ มา จาก เดิน เล่น ตาม ชาย หาด

วัน นี้ ความ ขลัง ดัง กล่าว เริ่ม เสื่อม ลง แล้ว

ข่าว นี้ ได้ จาก แหล่ง ข่าว ที่ ไว้ ใจ ได้

ช่วย ย้าย กล่อง นี้ ไป ไว้ ที่ ห้อง นั้น หน่อย

ชาว บ้าน ช่วย กัน ตาม หา เด็ก ที่ หาย ไป

แหล่ง ดึง ดูด นัก ท่อง เที่ยว

งาน ที่ ได้ รับ มอบ หมาย

นี่ คือ ถนน นั่น ใช่ ไหม

วัน นี้ ฉัน ไม่ ไป ไหน

ฉัน ไม่ ได้ เขียน จด หมาย

เธอ ต้อง ขัด รอง เท้า ทั้ง หมด นี้

ปลุก ฉัน เวลา หก โมง เช้า ให้ ได้

ปลูก เรือน พอ ตัว หวี หัว พอ เกล้า

ต่าง กัน เหมือน ช้าง กับ ยุง

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All Done! Thanks for playing.
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