Morse Code Decoder

A 6.111 Final Project

by
Christopher Stephenson

Why choose Morse Code?

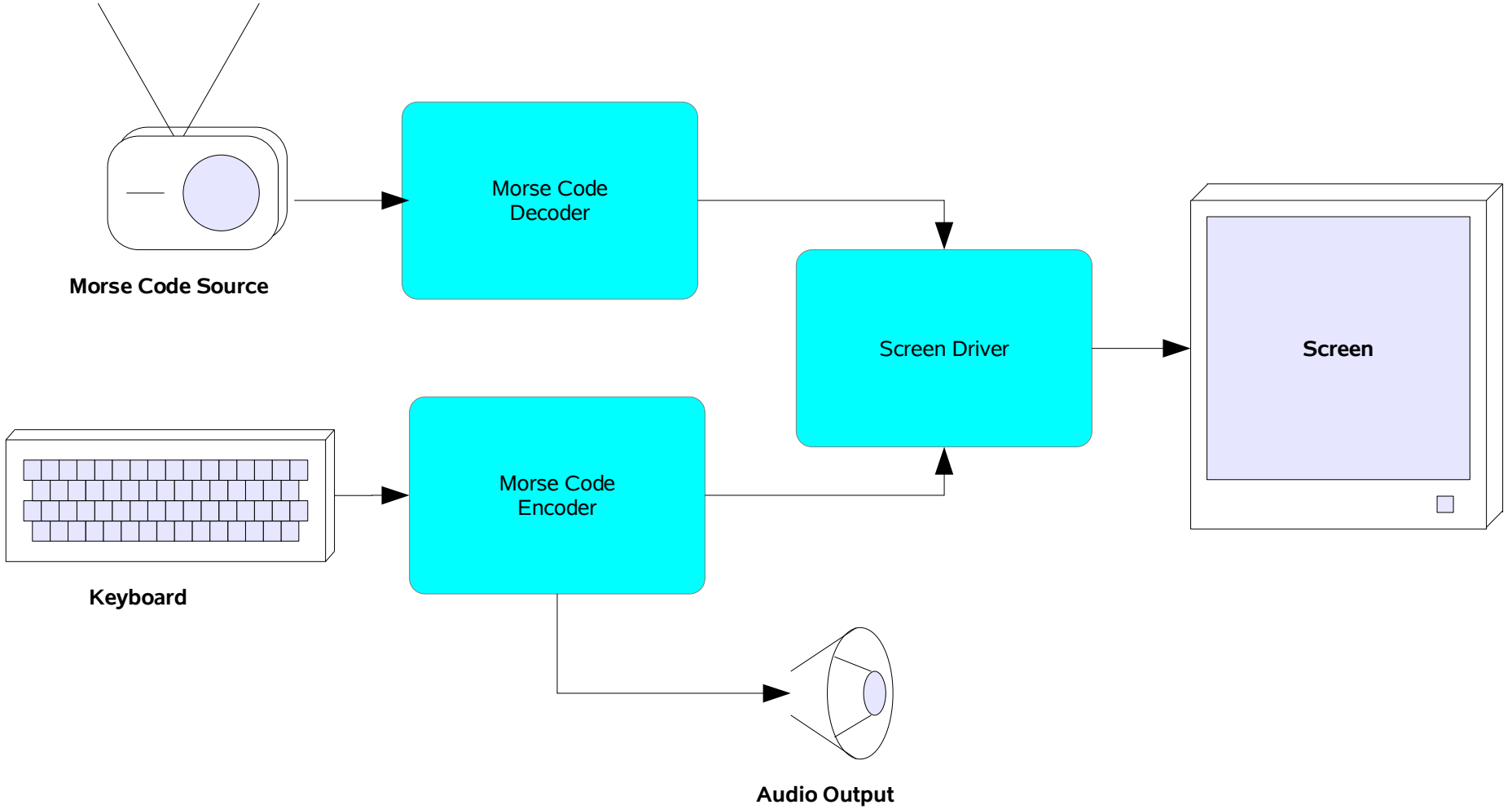
- Interesting to get a digital system to read
- Relatively easy to get digital system to read
- Good opportunities for interesting input / output
- Gives something to play with

Morse Code Specification

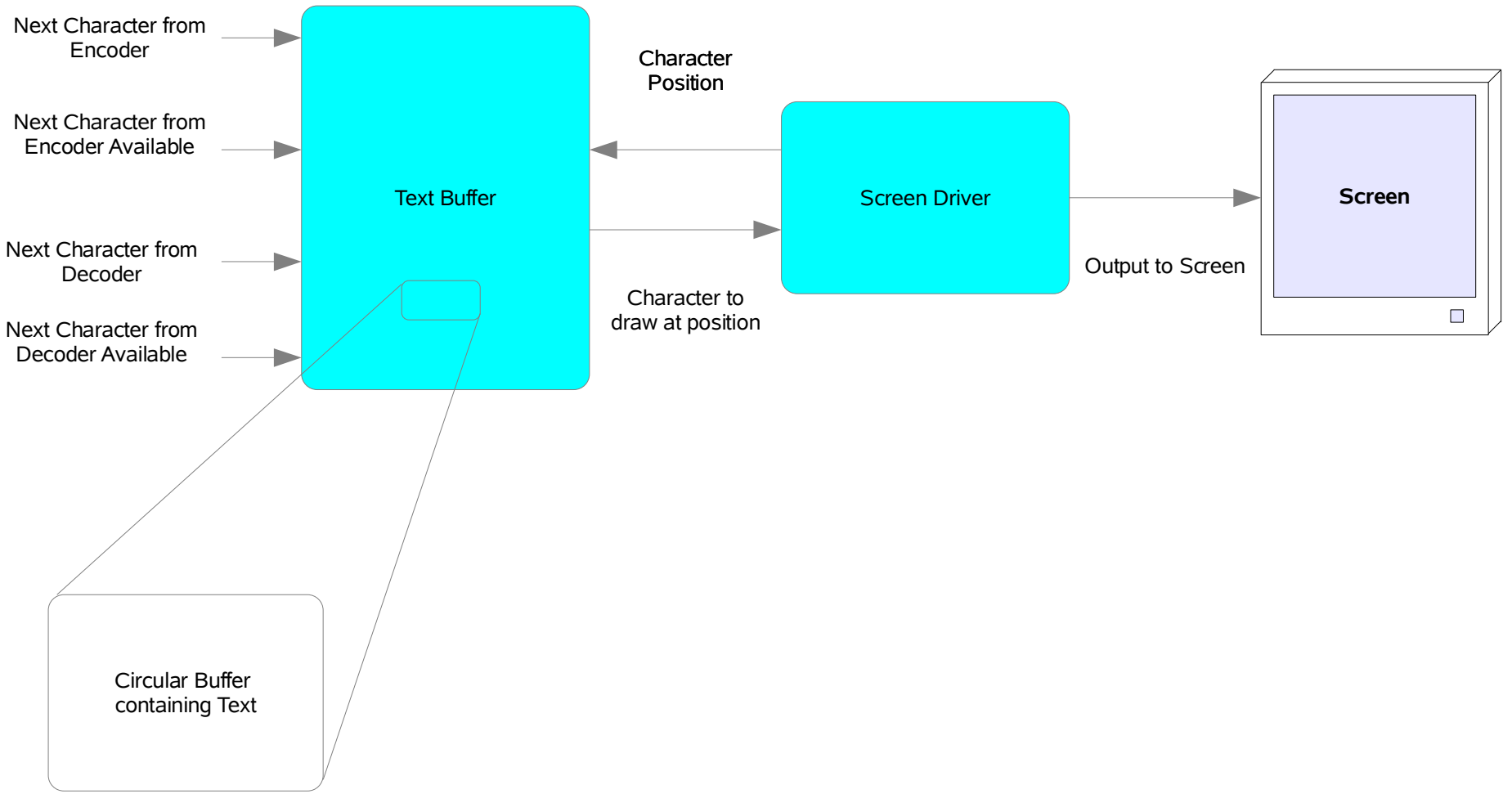
A	·–	N	–·
B	–···	O	–––
C	–·–·	P	·––·
D	–··	Q	––·–
E	·	R	·–·
F	··–·	S	···
G	––·	T	–
H	····	U	··–
I	··	V	···–
J	·–––	W	·––
K	–·–	X	–··–
L	·–··	Y	–·––
M	––	Z	––··

- Timings based off dots which are 1 unit
- Dash is 3 units
- Pause between dots and dashes 1 unit
- Pause between letters 3 units
- Pause between words 7 units

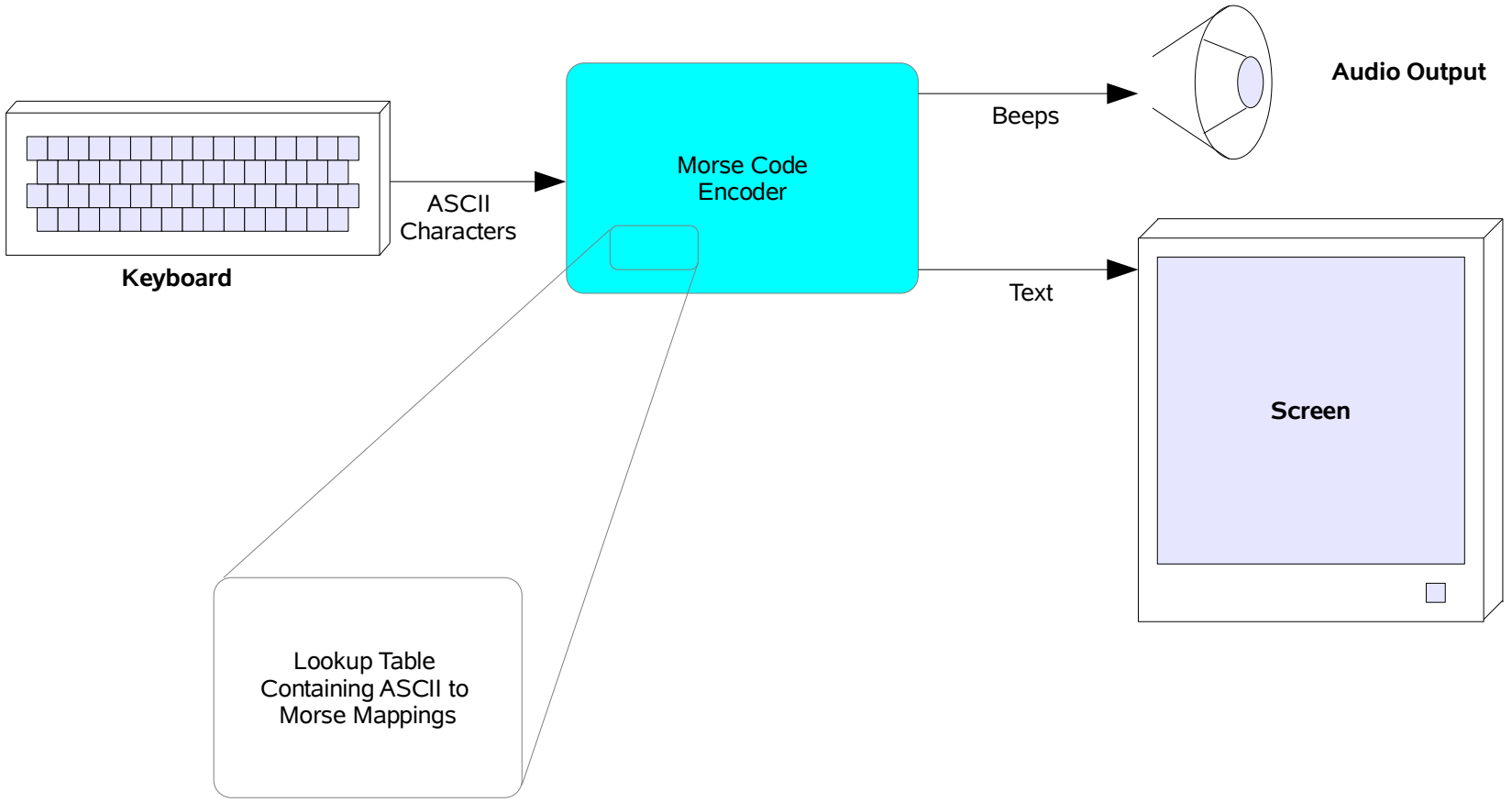
System Overview



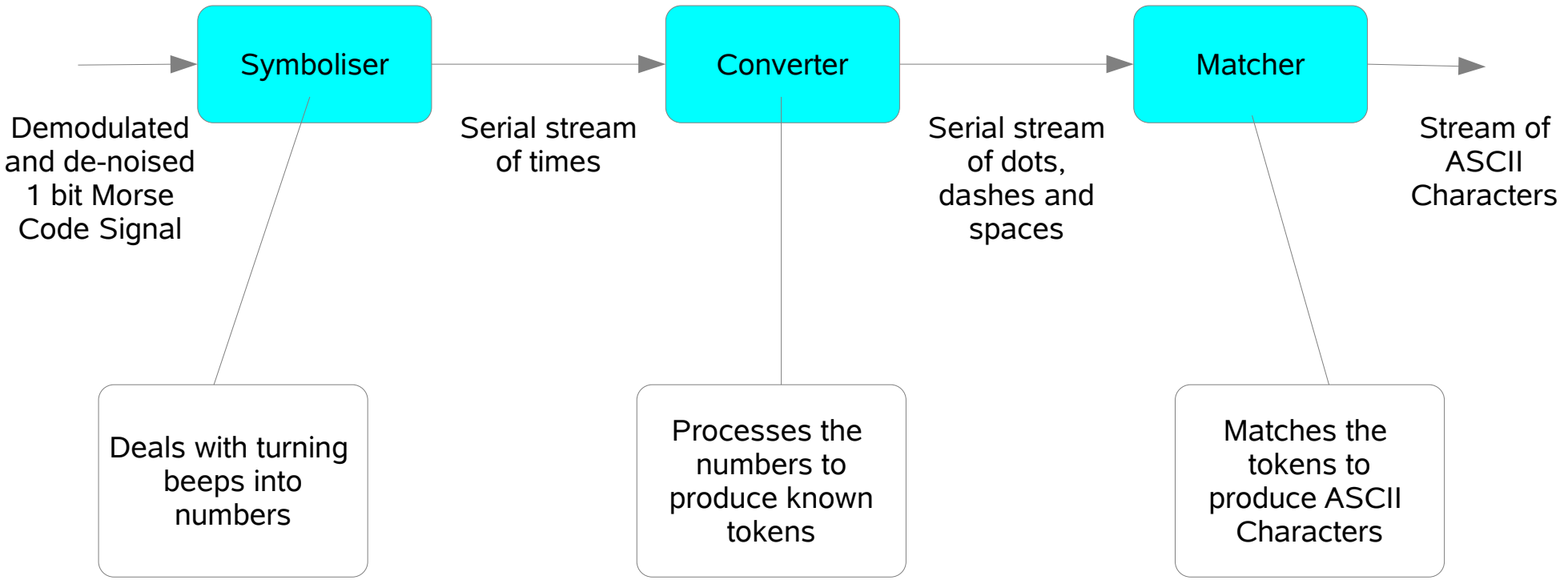
Screen Driver



Encoder


Keyboard
ASCII
Characters
Morse Code
Encoder
Beeps
Audio Output
Text
Screen
Lookup Table
Containing ASCII to
Morse Mappings

Decoder


Symboliser
Converter
Matcher
Demodulated and de-noised 1 bit Morse Code Signal
Serial stream of times
Serial stream of dots, dashes and spaces
Stream of ASCII Characters
Deals with turning beeps into numbers
Processes the numbers to produce known tokens
Matches the tokens to produce ASCII Characters

Converter in Detail

- Must determine the “Clock”
- Must classify pulse lengths into dots and dashes
- Must classify gaps as Inter character or inter word spaces
- Uses Moving Average
- Determines threshold lengths from previous stats
- Allows it to be robust to change of symbol rate

Extensions

- Using an FFT, detect what part of an audio spectrum contains a Morse signal
  - Requires DSP to clean up and demodulate signal
- Process “Non Ideal” Morse – i.e. Human tapped Morse
  - Requires that the Converter be made more robust
- Recognize a tapper's Fist
  - Not sure if this is actually possible given the time, but might be worth a shot!

Timeline

Week 1	Screen Driver Complete	11/18 - 11/24
Week 2	Encoder Complete	11/25 - 12/01
Week 3	Main Decoder Complete	12/02 - 12/08
Week 4	Frequency Scanner and Final Report Complete	12/09 - 12/12

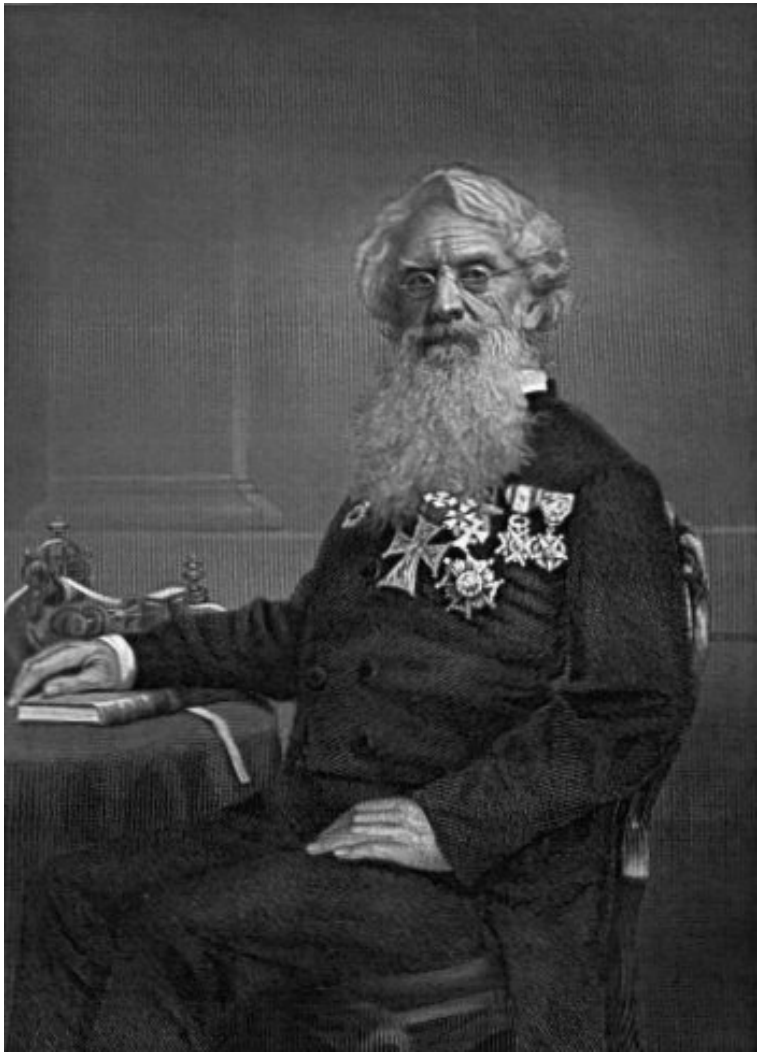
The aim is to get everything up to main decoder done

If the project slips, the frequency scanner will be dropped

If the project under runs, a more robust converter will be added

Summary

- Produce a Morse Code decoder
- Decoder outputs to a screen
- Can also produce Morse from Keyboard input
- All done by the 12th of December



Samuel Morse,
Inventor of the Morse Code