Phonemes to Text

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1 Searle's Chinese Room

John Searle (1980) describes a hypothetical Chinese Room, occupied by a human who speaks only English, who is following a rule book also written in English. The human is performing a task with piles of paper that happen to be written in Chinese. He is, in fact, reading questions written in Chinese characters and responding to them by writing Chinese characters. Except that the human does not know this. All he knows is that he is following the rules written in the book. Searle's Chinese Room is used in the field of Artificial Intelligence to prove that even if a computer could answer questions in Chinese (or English or any other language), it does not imply that the computer understands what it is doing.

2 Task

Your task is to write the rule book for the Transcription Task. (This is similar to writing a computer program, but does not require that level of rigor and debugging that often accompanies the writing of such programs.) Your rules will be followed carefully and reliably by a human. His task (the Transcription Task) is to transcribe a stream of phonemes into written words. The phonemes and words correspond to an utterance made in English.

For simplicity, we will ignore the task of punctuation. All he must do is create a correct stream of words, as they would be identified by a native English speaker that heard the original utterance.

(1) Prepare careful and complete instructions that could be followed by a diligent human to process phonemes into text. Do not assume that the human speaks English (although he can read and understand your instructions). He is in effect deaf and mute, having no experience with sound.

Unless you are very clever, you will need a (partial) dictionary for this task. **(2) Include your own dictionary** by consulting whatever resources you wish (including the CMU and Moby dictionaries), and to include in it any word (or name) you see fit. It would be nice, but is not required, that you organize it for expedience, to minimize the time your human processor spends searching.

(3) Provide an example of the instructions being followed by the transcriber, in transcribing some reasonable portion of the given utterance. You need not transcribe the entire utterance, but you must give enough of an example so your readers can see your instructions being used in a realistic way.

3 Sample Rule Books

Here is a brief and incomplete sample of the kinds of instructions we are looking for. The instructions to the transcriber could be word-first, as follows. Each of these instructions is legal.

- Take the first word from the dictionary.
- Find its phonetic pronunciation.
- Scan through the actual utterance.
- If pronunciation is found, replace with the word.
- Repeat for each word in the dictionary.
- The result will be the completed transcription.

This approach has several drawbacks, and probably fails to work in most cases. Here is a phoneme-first approach. It also has problems.

- Sort dictionary into phonetic order.
- Take the first phoneme of the utterance.
- See whether it is in the dictionary.
- Try again with the first two phonemes.
- Continue with longer strings of phonemes.
- Replace phonemes with the longest string found.
- Take the first remaining phoneme of the utterance.
- Repeat until the whole utterance is transcribed.

Invalid Instructions: The most important rule is that each instruction you write can be carried out by someone unfamiliar with the specific language, in this case English. You must use sub-tasks that are

fairly mechanical in nature. Here are some examples of instructions that would be illegal.

• Repeat the phonemes faster and faster until you "hear" the word. (Violates the deaf-mute condition.)

• Look for words that you recognize. (Not detailed enough; tell how.)

4 Illustration

You must illustrate your method by giving an example of how the processor would follow your instructions in decoding this particular utterance.

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.pau ?* aI m pc ph l @ n_( i: N tc th I
tc th E n d I kc kh > n f 3r n .epi s ^ n
s i: @ d( ^ l w > S i: N tc th E n .bn
.br .pau ?* A_fp I_?  I n &_?  >_?  > gc
g I s tc th .br .pau f 9r & m D I tc th w
& n_( i: f I f tc th Ix D I tc th w & n_(
i: n aI n T aI_?  aI m tc th 9r ei n tc
th I dc d I s aI dc d w Ix tc tS h oU tc
th ^ l tc th &_h s tc th ei I n s ^ D ^
d( aI kc kh n_= bc b i: kc kh l oU s tc
th Ix D_0 Ix kc kh A n .epi f 9r Ix n s
.epi l oU kc kh ei S E n .pau .br .pau w
Ix tc tS I z E tc D i: .br .pau .br .pau
?* A_fp s i: E dc d ^ l .pau ?* &r D ^ w
> S i: N d I n s tc th ei tc kh &_h n v I
n tc th S Ix n s I n_( 3r .pau .br .pau
?* >_fp m_fp .pau d I kc kh A n f 9r Ix n
.epi s I z pc ph ^ d( A n bc b aI m aI kc
kh 9r Ix s A f .ln tc th I_?  n I tc th s
A kc kh A n f 9r Ix n .epi s & bc b aU
aU_?  tc m_?  aI kc kh 9r Ix s ^ f tc d I
f ^ l &_?  pc m_?  & n tc th u: l s_ln
.bn .br .pau .ns .pau .ns ?* I n kc kh l
u: d( i: N s i:_: i:_?  @_?  @ n D I 9r_?
n u: f I Z w oU bc b ei s Ix kc ph 9r oU
gc g 9r @ m i: N l ei N g w ^ tc tS .pau
.br .pau .br D Ix kc kh ^ n f 9r Ix n
.epi s I z A_fp A_?_fp .br .pau .br .pau
9r ^ n s &_?  >_?  > l D I s E S I n s ^
D ^ kc kh A n f 9r Ix n s 9r ^ n > l dc d
ei l > N gc g .pau f 9r ^ m m_?  ei tc
n_= D ^ m oU 9r n i: N tc th & l s I kc
kh s I_?  tc n_?  n aI tc th .pau .br
.pau .bn .pau .bn .pau .bn .pau D ei kc
kh ^ v 3r > l .pau .ns .pau ?* @ s pc ph
E kc kh s ^ D i: z dc d Ix v ^ l pc m & n
tc th u: l s .bn
```

5 Sample Translation

The required translation of these phonemes is as follows. Filled pauses may be omitted.

> i'm planning to attend a conference in seattle washington uh in august from the twenty fifth to the twenty ninth i'm trying to decide which hotel to stay in so that i can be close to the conference location which is at the uh seattle or the washington state convention center uhm the conference is put on by microsoft and it's a conference about microsoft development tools in including c and their new visual basic programming language the conference is uh runs all the sessions of the conference run all day long from eight in the morning till six at night they cover all aspects of these development tool

6 Sample Dictionary

attend	`I tc th E n d`
conference	`kc kh > n f 3r n .epi s`
i'm	`aI m`
planning	`pc ph l @ n_( i: N`
seattle	`s i: @ d( ^ l`
to	`tc th I`
washington	`w > S i: N tc th E n`

7 Phonetic Alphabet

The sample utterance is provided in WorldBet phonemes. If you are more comfortable with another phonetic alphabet, you can include in your rules steps like these.

• Replace all `kc kh` with `k`

• Replace all `pc ph` with `p`

• Replace all `tc th` with `t`