T9 and Tries

CSE 303 Homework 4, Autumn 2008
T9 Predictive Text

• **What is T9? Demo**

• T9onyms:
  
  1. **22737:** acres, bards, barer, bares, baser, bases, caper, capes, cards, cares, cases
  
  2. **46637:** goner, goods, goofs, homer, homes, honer, hones, hoods, hoofs, inner
  
  3. **2273:** acre, bard, bare, base, cape, card, care, case
  
  4. **729:** paw, pay, Paz, raw, ray, saw, sax, say
  
  5. **76737:** pores, poser, poses, roper, ropes, roses, sorer, sores

• How does T9 order T9onyms?
  
  – Assignment Requirement: Alphabetical order
  
  – Extra credit options: Frequency, Dynamic Frequency
Trie

• Tree structure: n-ary tree
• We use a trie to store pieces of data that have a key (used to identify the data) from an alphabet
  – Optionally can also hold a value (which holds any additional data associated with the key).

• Applications:
  – Spell checkers
  – Auto-complete
  – Data compression
  – T9 predictive text input for cell phones
  – String search
Example: String Search

• Goal:
  – Determine if a given word appears in a block of text.
  – Optimize for multiple searches in the same block of text

• What do we do?
  – Place each word in the block of text into a data structure
  – Use data structure to determine whether a word exists in that block of text

• Which data structure should we use?
String Search Trie

- Text: sells sea shells by the shore
String Search Trie

- Search for: shells

```
  b
   y
    [by]

  a
   l
    l
     s
      [sells]

  e
   l
    l
     s
      [shells]

  h
   e
    [the]
     [shore]
```
Building a Trie for T9

- How is a T9 Trie different?
  - Alphabet: {2-9}
Handling T9onyms

[Diagram of T9onomy tree with nodes and arrows, showing the mapping between input keys and output words like 'car' and 'cap'.]
Handling T9onyms
Extra Credit

• More accurately implement T9:
  1. Store the prefix of each word in the text file in the trie—
     - example: foobar- “f”, “fo”, “foo”, “foob”, “fooba”, “foobar”
  2. Order a word in the Trie by its frequency
     - A word with a higher frequency will be predicted before a lower frequency word. In the text file (listed on assignment), the format of an entry will be
     word     frequency
  3. Update the frequency of a word
     - Each time a word is used, increment the word’s frequency
     - Prediction of words should use updated frequencies