Multiway TRIE

12.3 MULTIWAY TRIES

12.3.1 Definition

A multiway trie (or, simply, trie) is a structure that is particularly useful when key values are of varying size. This data structure is a generalization of the binary trie that was developed in the preceding section.

A *trie* is a tree of degree $m \geq 2$ in which the branching at any level is determined not by the entire key value, but by only a portion of it. As an example, consider the trie of Figure 12.6 in which the keys are composed of lowercase letters from the English alphabet. The trie contains two types of nodes: *element*, and *branch*. In Figure 12.6, element nodes are shaded while branch nodes are not shaded. An element node has only a *data* field; a branch node contains pointers to subtrees. In Figure 12.6, each branch node has 27 pointer fields. The extra pointer field is used for the blank character (denoted Ƅ). This character is used to terminate all keys, as a trie requires that no key be a prefix of another (see Figure 12.7).
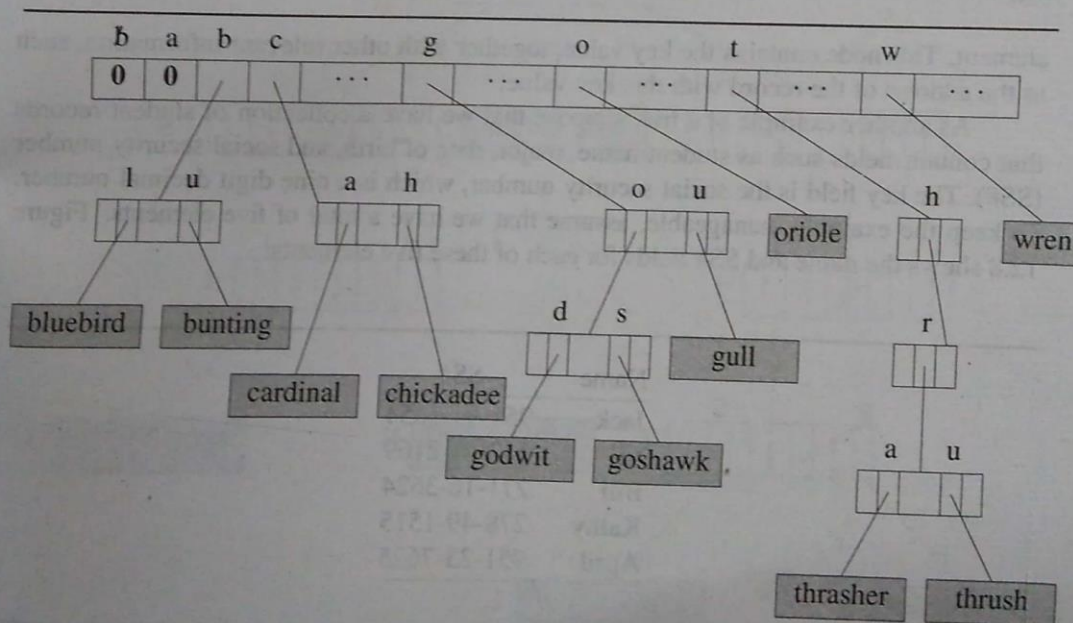

Figure 12.6: Trie created using characters of key value from left to right, one at a time

At the first level all key values are partitioned into disjoint classes depending on their first character. Thus, $root \rightarrow child\,[i]$ points to a subtrie containing all key values beginning with the *i*th letter. On the *j*th level the branching is determined by the *j*th character. When a subtrie contains only one key value, it is replaced by a node of type