

Analysis: Bilingual

Construct a graph with a node for each sentence and word. For each sentence S , add edges in the graph between the node for S and each of the nodes for the words in S .

Now consider a path in the graph from sentence 0 to sentence 1. The nodes on the path will alternate between sentences and words. Since the language of the sentences in the path must at some point change from English to French, one of the words along the path must belong to both languages. We need to find a minimal set of words such that every path from sentence 0 to sentence 1 in the graph goes through one of the words in the set. This is equivalent to finding a minimal vertex cut in the graph, where the cut vertices can only include the nodes for words.

We can solve this by transforming the problem into an edge cut problem in a directed graph. For each word w , create two nodes A_w and B_w . Add a directed edge from A_w to B_w with capacity 1, and for each sentence S which contains w , add directed edges from S to A_w and from B_w to S , both with infinite capacity.

Now we find the size of the minimum cut using a maximum flow algorithm, and the [max-flow min-cut theorem](#). Each edge in the cut will cut the edge from A_w to B_w for some word w , since those are the only finite-capacity edges. These words form a minimal set of bilingual words which solves the problem.