

Suppose that G has an edge $e = \{a, b\}$ that does not belong to T . Since T is a depth-first search tree, one of the two ends must be an ancestor of the other — say a is an ancestor of b . Since T is a breadth-first search tree, the distance of the two nodes from u in T can differ by at most one.

But if a is an ancestor of b , and the distance from u to b in T is at most one greater than the distance from u to a , then a must in fact be the direct parent of b in T . From this it follows that $\{a, b\}$ is an edge of T , contradicting our initial assumption that $\{a, b\}$ did not belong to T .