# The Theory of Computation

Bernard M.E. Moret

Addison-Wesley-Longman, 1998

## *Solution Manual*
## *Chapter 3, Problem 3.30*

This language need not be regular. The problem is that this operation enables us to match exactly in length two otherwise independent substrings, something that an FA normally cannot do. Consider the regular language $L = \{0^i 1 2^j \mid i, j \geq 1\}$ and the regular language $L_1 = \{0^i 2^j \mid i, j \geq 1\}$. Now, if $FL(L)$ is regular, the new language $L' = FL(L) \cap L_1$ must also be regular, since regular languages are closed under intersection. But it is easy to see that $L'$ is our old non-regular acquaintance $L' = \{0^i 2^i \mid i \geq 1\}$. (By intersecting with $L_1$, we retain only strings from $FL(L)$ that have no 1 in them; since every string in $FL(L)$ begins with a 0 and ends with a 2, the first third selected must contain only 0s and the last third selected must contain only 2s, and the two must have the same length.) So, even though our chosen $L$ is regular, $FL(L)$ is not.