Since its appearing in 1996 [2], the Stockwell transform (S-transform) has been used as a tool in medical imaging, geophysics and signal processing in general. In this talk, we prove that the system of functions (so-called DOST basis), introduced by R. Stockwell in [3], is indeed an orthonormal basis of $L^2((0,1])$, which is a time-frequency localized basis, in the sense of Donoh-Stark Theorem [1]. This approach provides a unified setting in which to study the Stockwell transform and its orthogonal decomposition in the framework of generalized Stockwell transforms, in sense of Wong and Zhu [5]. Finally, we introduce a fast – $O(N \log N)$ – algorithm to compute the Stockwell coefficients for general windows. This algorithm includes the one proposed in [4] as a special case. The results are obtained in collaboration with Luigi Riba.

References