Bivariate Koornwinder-Sobolev orthogonal polynomials

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The purpose of this talk is to introduce the so-called Koornwinder bivariate orthogonal polynomials. These polynomials are generated by means of a non-trivial procedure involving two families of univariate orthogonal polynomials and a function $\rho(t)$ such that $\rho(t)^2$ is a polynomial of degree less than or equal to 2. We also discuss how to extend the Koornwinder method to the case when one of the univariate families is orthogonal with respect to a Sobolev inner product. Therefore, we study the new Sobolev bivariate families obtaining relations between the classical original Koornwinder polynomials and the Sobolev one, deducing recursive methods in order to compute the coefficients. The case when one of the univariate families is associated to a classical inner product is analysed. Finally, some useful examples are given.