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Taking Twisted Classical light for a Quantum Walk

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Computational power available with classical computers has become increasingly limited for the scope required by many applications such as simulation and modelling in developmental research as well as factorization of large numbers. The solution for many of these problems lies in the development of quantum computers for which the physical implementation of quantum walks (QW) has been shown to provide a successful computational basis. Preforming such quantum walks is subsequently a promising route with derived algorithms already providing a comparative speedup to many of the classical alternatives. Substantial drive towards establishing a means of achieving QWs over the 20+ years since its introduction has occurred with entities such as ions, electrons and photons being utilized. Application of these walks on the quantum scale has not exceeded a few steps, however.

Here we consider exploitation of the 'classical entanglement' inherent in vector beams to perform such a physical implementation of quantum walks in orbital angular momentum space through polarization control. This method offers great advantages due to the robust nature of classical light manipulation as opposed to the vulnerability of quantum systems to environmental influence which limit the achievable length of the walk.

Apply to be
 considered for a student
   award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
   PhD, N/A)?

MSc

Main supervisor (name and email)
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Would you like to
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No

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