Study of the discrete Painlevé equations and related systems

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We propose a new, systematic, method for the derivation of all discrete equations associated to some continuous Painlevé equation (focusing in the present program on Painlevé equations III and IV). Our method is based on the systematic derivation of all integrable autonomous forms that may constitute discretisation of the Painlevé equation(s) in question followed by an integrable deautonomisation with the help of some integrability criterion.

By applying various limiting procedures on the discrete equations obtained we expect to be able to derive all the linearisable systems related to equation under consideration.

The objectives of the project are:

• Obtain new discrete forms for Panlevé equations (dPs)
• Interpret these equations in terms of the existing classifcation of dPs
• Obtain limiting forms of these equations
• Identify new linearisable systems among the limiting forms
• Study special solutions of these new dPs
• Integrate the new linearisable systems