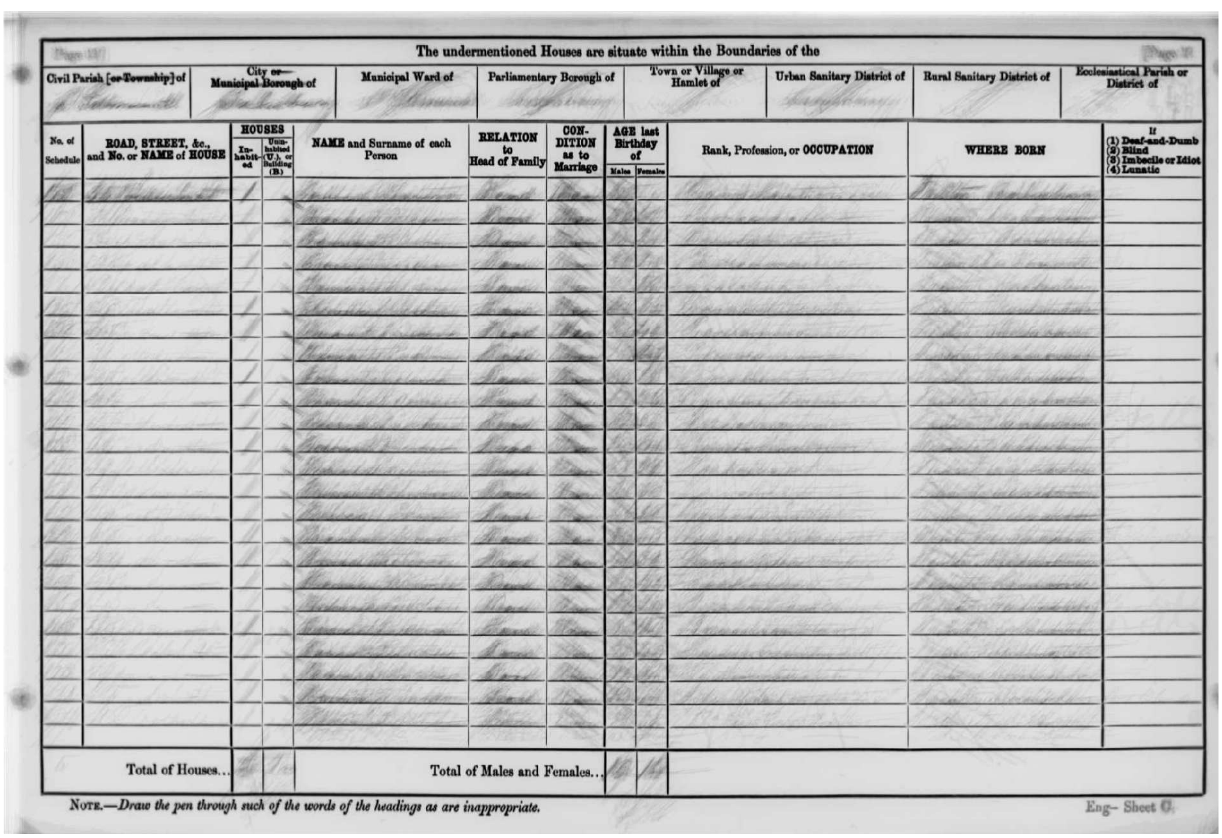
FHT 2004

Tabular Document Image Registration Using the Fourier-Mellin Transform

Luke Hutchison (lukeh@byu.net)
Computer Science, BYU Provo

Abstract. *Image registration*, or the detection and reversal of the transformation that best maps one image to another, is a useful tool in digital processing of microfilm images. Having properly-aligned microfilm images can help in manual and automated content extraction, document zoning, and compression of batches of related tabular document images. An image registration algorithm is presented for quickly identifying the global affine transformation (rotation, scale, translation and/or shear) that maps the tabular template in one document to another, using the Fourier-Mellin Transform (from signal processing theory). This registration method deals with all components of the affine transform in a uniform way, by recovering each component in the frequency domain. This contrasts with current techniques for document image registration, which usually rely on a mix of unrelated techniques for different transform components. Each component of the affine transform is made completely separable from the others, dramatically reducing the total parameter space of the problem. Registration is limited to foreground pixels (the document form and printed text) through the introduction of a novel, locally adaptive foreground-background segmentation algorithm, based on the median filter. Common problems with Fourier-Mellin image registration are eliminated by exploiting the properties of tabular document images. An original method is also presented for automatically obtaining blank form templates from a set of registered document images, by computing the median value across all registered documents at each pixel. Finally, image registration is demonstrated to be an effective tool for predictive compression of batches of document images which share the same template. The presented registration algorithm is able to handle a wider range of transformation types than most document image registration systems, which usually only perform deskewing, and is shown to be reliable and robust in registering several image datasets.



The undermentioned Houses are situate within the Boundaries of the

Civil Parish [or Township] of	City or Municipal Borough of	Municipal Ward of	Parliamentary Borough of	Town or Village or Hamlet of	Urban Sanitary District of	Rural Sanitary District of	Ecclesiastical Parish or District of

No. of Schedule	ROAD, STREET, &c., and No. or NAME of HOUSE	HOUSES Inhabited	HOUSES Uninhabited (U.), or Building (B.)	NAME and Surname of each Person	RELATION to Head of Family	CONDITION as to Marriage	AGE last Birthday of Males	AGE last Birthday of Females	Rank, Profession, or OCCUPATION	WHERE BORN	If (1) Deaf-and-Dumb (2) Blind (3) Imbecile or Idiot (4) Lunatic
	Total of Houses...			Total of Males and Females...							

NOTE.—*Draw the pen through such of the words of the headings as are inappropriate.*

Eng– Sheet C.