PRACTICAL AND MATHEMATICAL ASPECTS OF THE PROBLEM OF RECONSTRUCTING OBJECTS FROM RADIOGRAPHS[1]

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CHAPTER I. PRACTICAL ASPECT

1. Introduction. Having done pure mathematics for a good many years, I became interested about three years ago in practical problems in medical radiology–specifically in the problem of finding tumors, hemorrhages, and other lesions of the brain with ordinary hospital equipment and without the introduction of contrast material.

This is a significant and unsolved medical problem. The soft tissue density differences within the brain are so small that, masked by the heavy and variable skull, they are invisible on ordinary radiographs. The traditional procedures of radiology involve the injection either of air or of an x-ray opaque dye. Both are painful and dangerous, and the information obtained is often meager. In fact, very sick patients are unable to support the tests. On the other hand, the last few years have seen remarkable advances with the advent of the EMI scanner and its descendants. The scanners take a large number of radiographs around a semicircle and use the computer (in a way that is described in §2) to produce cross sections of the density function. The information obtained in this way is far more accurate and complete than that from the traditional procedures, and it is obtained either without contrast