

### III.3.2 The W-diagram and L-diagram

Representing the images (or coimages) of basic interval relations in the MR-diagram produces the *W-diagram*, see Fig. III.11. The diagram is very useful in investigations of the properties of *AIRs*. The lines and regions in the *image W-diagram* (Fig. III.11a) constitute the images of an arbitrary thick interval  $u$  under all 13 basic interval relations. The images are labelled by graphical symbols of corresponding relations. As  $u \diamond = \diamond^{-1}u$ , the coimage diagram (Fig. III.11b) is essentially the same as the image diagram, only with all relations changed to their inverses (inverse relations are placed in the diagram symmetrically with respect to the “=” relation). An important feature of the diagram, responsible for its usefulness, is that the structure and shape of its elements (images and coimages of some thick interval) do not depend on the choice of the interval  $u$ , hence most of the properties of these images and coimages can be also safely considered as appropriate properties of the corresponding relations.

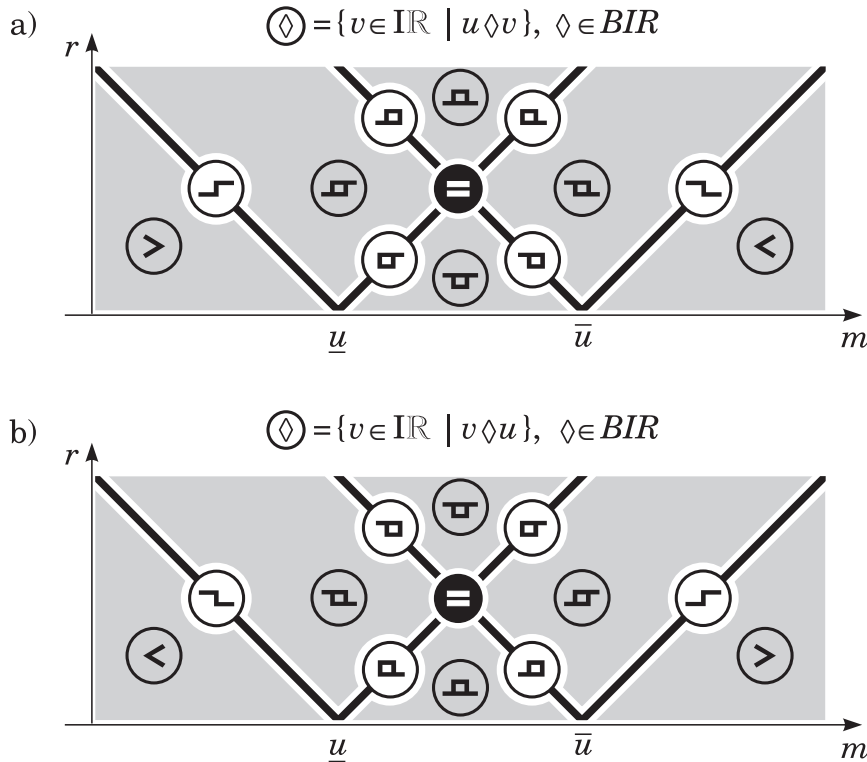


Figure III.11: The image (a) and coimage (b) W-diagrams of basic interval relations.

As can be easily seen from the diagram, all *BIRs* are disjoint and cover the whole space of intervals, i.e., every pair of intervals belongs to exactly one of these relations.<sup>4</sup> The diagrams show also that the basic relations fall into three distinct classes according to the dimensionality of their images: 0-dimensional (a point; the “=” relation only), 1-dimensional (lines), and 2-dimensional (regions). The circular labels of the images in Fig. III.11

<sup>4</sup>Strictly speaking, this holds exactly only when one excludes the thin intervals coinciding with endpoints  $\underline{u}$  and  $\bar{u}$  of the interval  $u$ . They belong to images (or coimages) of two relations, as can be seen in the diagrams. The exception, minor as it is, can be eliminated either by introducing additional basic relations, or by restricting the analysis to thick intervals only. The latter approach is taken here, see the remark at the beginning of Section III.3.1.