The bifurcation geometry of grazing orbits for an impact oscillator can be characterised in terms of a divergent diagram of two singular map germs $\mathbf{R}^2 \to \mathbf{R}^2$. For a non-degenerate grazing orbit both map germs are fold singularities, and we show how the geometry of the divergent diagram captures very simply the essence of the bifurcation behaviour of grazing periodic orbits of a given (forcing) period. Using the same ideas we attempt to capture bifurcation of more degenerate impacting orbits, and describe the more delicate divergent diagram geometry that ensues.