Consider a current-carrying wire bent into the shape of a square with side $2a$. Find direction and magnitude of the magnetic field generated at the center of the square.

The magnetic field $B$ at the center of a square wire of side $2a$ with current $I$ can be calculated as:

$$B = 4\mu_0 \frac{I}{4\pi a} \left[ \sin(45^\circ) - \sin(-45^\circ) \right] = \frac{\sqrt{2}\mu_0 I}{\pi a}.$$