Abstract A known problem in endoscopic surgery (especially with flexible video endoscopes) is the absence of a stable horizon in endoscopic images displayed on a monitor. With our “ENDOrientation” approach, image rectification, even in non-rigid endoscopic surgery (particularly NOTES), can be realized with a tiny MEMS tri-axial inertial sensor placed on the tip of an endoscope. This sensor measures the impact of gravity on each of the three orthogonal accelerometer axes in real time. After an initial calibration and temporal filtering of these three data streams, the rotation angle of an endoscope can be estimated directly. The achievable sampling rate of the inertial sensor is above the usual endoscopic video frame rate of 25 Hz; the rotation accuracy is approximately one degree. The image rectification can be performed in real time by digitally rotating the endoscopic video signal. Improvements and benefits have been evaluated in animal studies: coordination and movement of different instruments was rated to be much more intuitive with a stable horizon on endoscopic images. The recorded time stamps and position tracks clearly support this observation.