2.5. Determination of the directions and angles of impact and the centres of origin

The direction of impact and the vertical flight path plane in the room can be determined by using the angle of impact and the directionality of the bloodstain. The angle of impact of the blood drop, which is formed between the direction of the blood drop and the flat surface that is struck, is calculated based on the relationship between the length of the major and minor axes of the elliptical bloodstain. In addition, the directionality of the bloodstain is ascertained from the longitudinal axis of the ellipse and the direction in which the spin points. In this manner, the directionality and length of the major and minor axes of the ellipse of all well-defined bloodstains on walls, ceilings and on furniture that has not been removed are accurately measured. Based on these measurements, the assumed straight line for the flight path of the bloodstains is calculated and drawn in the 3D model of the crime scene using CAD software. To reduce errors in determinating impact angles, only bloodstains with low impact angles have been considered in the analysis.

In a top view of the impact directions of the bloodstains, convergence areas are shown in groups of straight lines in high concentration, which intersect one another. These convergence areas are possible centres of origin for the corresponding bloodstains. In a side view, the height of the centres of origin is determined by finding the average intersections of only the straight lines of the bloodstains which occur at a short distance from the blood source location. The photogrammetry software Elcovision 10 in combination with the AutoCAD software performs an automatic calculation of all measured ellipses and draws the calculated straight lines of the directions of impact of the bloodstains in the 3D model of the crime scene. Then the centres of origin are determined automatically by software, or manually, based on the produced 3D model.

2.6. Ballistic determination of the trajectory of the blood spatter

For the determination of the blood source location, the trajectories of bloodstains, which are of a short distance from the blood drop origin, can be assumed as straight lines. In cases of longer distance, a difference in the vertical component between the spatial direction of impact (in the vertical plane) and the expected centre of origin arises, because of the curved trajectory of the drop. In these cases a ballistic determination of the trajectory of a blood drop is performed in order to show whether these bloodstains arise from the determined centre of origin or from a different origin.