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'On the Design of a side-looking Drone-borne GPR and its Physical Basis'

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In this paper, we propose the technical design and the physical basis of a side-looking-drone-borne- ground- penetrating radar for humanitarian applications, particularly in the context of disaster management. Using estimated values of radar echoes from sub-surface volumes and the physics of reflected signals measured along Brewster Angle incidences, a radar-channel signal budget will be detailed.

Using a scenario typical to disaster events, the geometry and parameters of the sought GPR will be identified. Following this step, the technical design and the associated signal processing of the proposed GPR will be considered. In doing so, the physical constraints on weight and power set by the drone platform will be duly addressed.

The contribution will address the technical challenges of designing such a radar system that is capable of drone-mounted operation and at the same time sensitive enough to register sub-surface echoes resulting from oblique incidence of the radar signal on the ground.

A key question to be addressed in the paper is the method for obtaining meaningful resolution in range and azimuth, whilst taking into account the small antenna aperture that such a GPR will typically permit. The possible strategies for addressing this important issue will be reported.

Another parameter of crucial interest to be covered will be the choice of the antenna to be deployed in such a system. The antenna to be used should conform to the severe restrictions on system-weight and the limited choice of low radar frequencies that inevitably have to be used.

Finally, a summary of the proposed system design its performance will be outlined.