**Abstract:** Detection and characterization of damages in civil structures is vital for public safety. Microwave/radar techniques are suitable for in-depth assessment of concrete structures since electromagnetic waves can penetrate into dielectric materials like concrete. Ground penetrating radar (GPR) is one of the widely-used techniques for concrete structures. In this research, Finite Difference Time Domain (FDTD) methods were used to study the scattering pattern of a delamination defect in a concrete slab.

**Theoretical background:** Radar signals or microwaves are governed by the laws of electricity and magnetism which can be described by Maxwell's equations.

\[
\nabla \times \vec{H} = \frac{\partial}{\partial t} \vec{D} \quad \nabla \cdot \vec{D} = 0
\]

\[
\nabla \times \vec{E} = -\frac{\partial}{\partial t} \vec{B} \quad \nabla \cdot \vec{B} = 0
\]

**Analysis:** A bistatic radar inspection was considered and used to generate B-scan images for analysis.

**Results:** Windowed B-scan images were processed and converted into parabolas for pattern recognition. A quadratic equation was developed between the delamination size \(w\) and the curvature difference \(\Delta \rho\).

\[
\begin{align*}
w = 3.72 \times 10^8 \Delta \rho^3 - 2.55 \times 10^5 \Delta \rho^2 + 2.825 \Delta \rho + 1.013
\end{align*}
\]

**Conclusion:** The curvature of the parabola, arch-like shapes obtained from B-scan images of concrete slabs shows a close relationship with the size of delamination are related. Finally, a procedure for estimating the size of subsurface delamination in concrete slabs is proposed.

**Ref:**