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(54) Title: MULTI-TARGET SPOT BEAMFORMING USING RECONFIGURABLE INTELLIGENT SURFACE

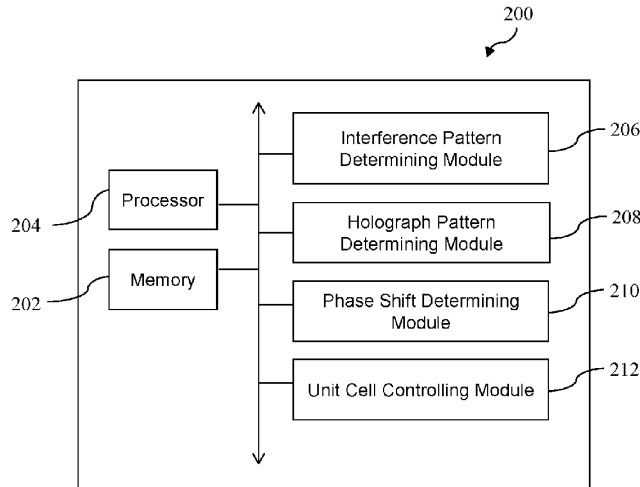


FIG. 2

(57) Abstract: A method of controlling a reconfigurable intelligent surface (RIS) is provided for multi-target spot beamforming at a plurality of target beam focus positions. The RIS includes a 2D array of unit cells, each unit cell being controllable to be at any selected one of a plurality of wave propagation path states for providing a corresponding degree of phase shift for an incident electromagnetic wave irradiated thereon. The method includes: for each of the plurality of target beam focus positions: determining, for each unit cell of the plurality of the 2D array of unit cells, an interference pattern at the unit cell between a reference wave from a multi-mode orbital angular momentum (OAM) signal transmitter to the unit cell and an object wave from the target beam focus position to the unit cell, the multi-mode OAM signal transmitter being configured to generate and transmit a multi-mode OAM signal to irradiate the RIS at a surface thereof; and for each unit cell of the plurality of the 2D array of unit cells: determining a holograph pattern based on the interference patterns determined at the unit cell for the plurality of target beam focus positions; determining a degree of phase shift for

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RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,
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the unit cell to provide based on the holograph pattern determined for the unit cell; and controlling the unit cell to be at a selected one of the plurality of wave propagation path states corresponding to the degree of phase shift determined for the unit cell to provide. There is also provided a corresponding RIS controller and a corresponding multi-target spot beamforming system.