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Performance of Di-code Pulse Position Modulation Technique in Diffuse Indoor Wireless Optical Communication Systems

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In order to evaluate the error probabilities, the output voltage, $V_o(t)$, and the mean square receiver output noise $<n(t)^2>$ are required, and these, in turn, depend upon the received pulse shape, the type of preamplifier employed, the associated noise power spectral density, and the type of equalisation filter employed.

DiPPM is a very attractive simple coding scheme for coding and implementation. There are four slots used to transmit one bit of PCM. In this technique, when the data transitions from logic zero to logic one are coded by $+V$ and transitions from logic one to logic zero by $-V$ if there is no change in the PCM signal zero pulse is present. However, in DiPPM, as shown in Fig.3.1, two signals SET and RESET are converted into two pulse positions in data frames. If no data transition is present, there is no pulse, while if transitions occur from zero to one or one to zero, there are SET(S) and RESET(R), respectively. If the PCM data is constant, no signal transmitter.

High Security
High Data Rate
Large bandwidth

DiPPM over Indoor Optical Wireless Channel via Diffuse Link

Simulations & Results
As with digital PPM, DiPPM system suffers from three types of errors, wrong-slot, erasure and false-alarm:
- **Wrong-Slot Errors:** These types of errors occur when the noise presents on the rising edge of a detected pulse, the pulse appears in adjacent time slots, before or after the next slot.
- **Erasure Errors:** An erasure error occurs when the noise level is larger than the pulse signal and reduces the peak signal voltage below the threshold level, thus giving incorrect detection.
- **False-Alarm Errors:** The false-alarm error occurs when the noise causes a threshold-crossing event in an unoccupied data slot.

Conclusion
The output received pulse and its slope are required as the basic signals to evaluate the performance of optical communication systems. Mathematical models have been developed for a DiPPM system over an optical indoor wireless channel via diffuse link. Thus output received pulse and its slope have been determined and illustrated by using MathCAD software.

Further work
The main further work is to investigate the performance of the optical DiPPM system over a dispersive indoor optical wireless channel via diffuse link with the view to understanding its benefits and limitations in terms of:
- Error probability.
- Variation in the bandwidth of preamplifier filter.
- Variation in the bandwidth of a third-order Butterworth filter.
- Using a Maximum Likelihood Sequence Detection (MLSD).
- Optimising the system performance in comparison of the relative values of DiPPM and a similarly performing digital PPM system.